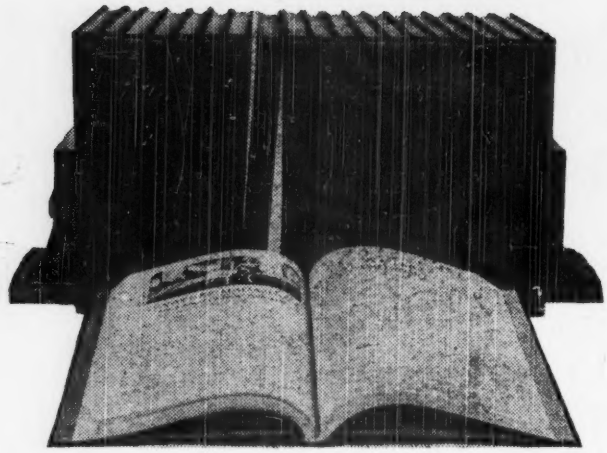
Snow Geese



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"A Letter"

Dear God:

I've been thinking this over in my mind for a long time now, God, and it's time to tell You about it. I used to think You didn't exist, but now it's impossible not to think so. Nature was my God before, but one day someone told me You made Nature. So I thought it over, and every day it sounded more and more like the truth to me.

Now people tell me all the time, God, that man is the only creature on Earth that has a Soul. Surely this isn't true! When You created life, surely man was not the only living thing to have such a privilege. In all fairness to other life, Nature must have a Soul, too.

People talk about walking down Your golden streets and living in golden houses, but, God, if I go to Heaven I would want paths going through woods and meadows, with flowers, and, yes, even weeds growing along the way. And birds to see and hear; insects and animals; fish in the streams.

Now my opinion, God, is that all living things have a Soul. And I also believe that when You created them, You made a vow to Yourself not to interfere in any way with what went on here on Planet Earth — not to interefere in any way, whether the creatures were good, or up to some evil. And, God, man has turned out to be the evilest of all. There are good ones, but the bad far outnumber the good. He has spoiled, is spoiling, and will continue to spoil Your Nature; taking life just for the so-called fun of it; taking it to prove to others that one man's gun will kill farther than the other's, and with better accuracy. I've done it, too, God, and I wish I could bring back to life every English sparrow, every slate-colored junco, every mole and gopher, every squirrel and rabbit, and every insect that I've snuffed the life out of. Surely God if You controlled it, You would not allow such a thing.

Once, God, a teacher of Your Bible came to my house and wanted to sell me Your Book. The first thing I noticed was that he did not like my dog. I asked him if my dog would go to Heaven with my wife and children. He said no. I refused to talk with him any more. I like my dog, God, and I know that she has a right to life after death as much as I do. Surely she will not simply die, and nothing more. If I go to Your Home, my pets have as much right there as I. I'm no better than they. I'm worse. I lie, and they don't. They don't even know how, and even if they could, I don't believe they would.

Do You know who I think You'll pick for Your two top places, God? — men like John Muir, John Burroughs, and Edwin Way Teale. They never harmed Your Nature, just wrote about it and tried to get other people to believe in it. My Mom and Dad and Wife never intentionally harmed Your Nature either. One time, though, Dad wanted to kill a horse that had worked for him till he was too old to work any more. Mom and I talked to him, and I think we made him see it wasn't right.

People will tell me, God, that I eat meat. Of course I do, and so do they. But all Nature lives off of each other. What I'm getting at is this business of taking life and leaving it lay, JUST FOR THE FUN OF IT. Man even got to the point of killing Your buffalo TO EAT THEIR TONGUES ALONE, leaving the rest of the huge beasts to rot. And look at the egrets! Imagine shooting them for ornamentations on hats, and leaving the young to starve. And that's just two cases out of hundreds. How far can man go, Lord? There's got to be a stopping point somewhere, or it'll be all over, completely finished.

And one final thing, God. If all Nature has a Heaven, please take me there when it's my time to go.

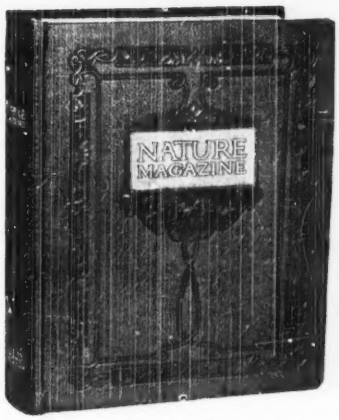
John Baxter

In sending in the above, John Baxter wrote that, ever since World War II, in which he served in the Infantry and "saw dead men by the score," something revolted him when it involved killing. He wonders what brought the change. "Was it the War?" he asks. And, in a postscript to his note of transmittal, Mr. Baxter says: "Please don't laugh at my prayer. I'm sincerely serious about everything I say." Laugh? Mr. Baxter! *Editor.*

Add 1949 Index

Inadvertently the authors' part of the index to the 1949 volume, as published in the December, 1949, issue was incomplete and the names of certain contributors were thus not immortalized in type. For those who may wish it we supply below the missing references, which include the year's contributions of the editor himself.

Schayer, R., 499.
Sharritt, Grace V., 316-318, 340.
Sklarewitz, N., 88-89.
Skutch, A. F., 69-72, 100, 173-175, 436-437.
Smiley, Doris V., 126.
Smythe, D., 172, 218, 432.
Starkweather, Pauline, 439.
Stefick, E. F., 19, 78.
St. Ledger, Roth, 166.
Taber, F. W., 275-277, 289.
Talabere, Annie J., 166.
Thomas, Martha B., 118.
Tilleniius, C., 464-468.
Tol[illegible] R. B., 507.
To[illegible]r, Dorothy, 185-187.
Trojanetzkoy, Ulrich, 58, 488.
Trump, F., 267-269, 288.
Tyler, Hazel V., 274.
Tyrrell, W. B., 481-484.
Underwood, J., 221.
Valjean, N., 361-362, 392.
Van Riper, W., 30-31.
Vesely, Ruth S., 232.
Walker, R. W., 228-29.
Westwood, R. W., 7, 57, 63, 113, 161, 209, 240, 257, 299, 303, 345, 351, 407, 463, 472.
Woodward, Carol H., 469-471, 499.
Whidding, J. G., 190, 250.
White, J. W., 263,265, 292.
Wilson, A. F., 323.
Wilson, Camilla W., 498.
Wilson, J. F., 363-365, 395.
Wing, A. S., 135-137, 148, 230-232.
Wofford, W. A., 40.
Wolkenhauer, Hazel E., 176-177.
Woodall, A. E., 83.
Wyatt-Semple, 207.
Zahniser, H., 2-3, 58-59, 106-107, 202-203, 250-251, 298-299, 346-347, 402-403, 458-459.



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Nature in Print

By HOWARD ZAHNISER

It is a time for calendars, for almanacs, and journals — a time for contemplating the cycle of the year, its seasons, and the passing days that make up our lives. The prospect of a new year turns us in retrospect toward the past, too, and the remembrances that have been set down — particularly those written with a sense of the seasons — seem most timely. *Countryman's Year, Halcyon Days and The Year at the Whistling Post, Possum Trot Farm: An Ozark Journal, A Sand County Almanac* — how apropos they all are!

Haydn Pearson it is who writes the *Countryman's Year*, and we who have known already his *Country Flavor* and his *Sea Flavor* know an extra delight in reading the short units that he has fashioned out of paragraphs and arranged in the order of this new volume. Although he starts his book — as he feels the natural year begins — with April, we turn now to his wintry pages and find that he too thinks at this season of the "cycle of time." Now, he thinks, is a period of rest, and from "the patience of winter" comes the "lesson in living" to be learned from the "scraggly arms of the sumacs lifted above snow-capped stone walls," from the sugar bush, the groves of white pines and hemlocks, the sleeping valley, the "windrows of mountains against the horizon." And with this homily on the "Patience of Winter," which introduces Mr. Pearson's January pages, is a description of the "poignant beauty on the countryside" in a page called "Deep Drifts." With it, too, are the nostalgic short sketches that give to *Countryman's Year* its distinctive New England charm — "Friday Afternoon Exercises," "Saturday Night Bath," "Box Supper," "Fixing Up for a Storm," and "Fried Potatoes." With similar topics clustering around a description and a contemplation of each of the other months of the year, we have here a volume that is both stimulating and cosy — a year's end book for wintry reading, a new year's inspiration to wisdom, too — wisdom in understanding the tempo of Nature and in appreciating the simplicities of living. "You lay it down," says Dorothy Canfield Fisher, "calmer, more relaxed, with a fresher eye for what there is in life, everywhere, to enjoy if we but look out on it with a seeing eye."

This is a book more to be enjoyed in many samplings than in continuous readings, and it is accordingly interesting to note that the newspapers of five cities are thanked in it for permissions to reprint. The volume's jacket tells us that Mr. Pearson is the "author of the country-life sketches on the editorial page of *The New York Times*." Likewise, this double little volume *Halcyon Days and The Year at the Whistling Post* is drawn from the editorial pages of a newspaper, its author, Walter Locke, having for some years — as Joseph Myers says in a foreword — "been conducting on his editorial page" in *The Dayton* (Ohio) *Daily News* "a rare sort of informal school for a large company of appreciative disciples." We at a distance are privileged by having now this printed book through which we all can attend this school of wisdom and kindliness and contentment. I have read these eighteen essays from *Halcyon Days*, and the thirty-nine from *The Year at the Whistling Post*, on Washington street cars while others who were as successful as I in ignoring the rude impertinence of the Capital Transit Co.'s advertising broadcasts were reading their newspapers, and I have thought how fortunate I am to have thus in a volume what must have been the best and most worthwhile parts of so many newspapers. Mr. Locke writes of his neighbors — wild and human — but mostly he writes of his own adjustment to the possibilities of living. His book is as good reading as one could wish for the holiday season and the new year's beginning. In the black-capped chickadee he sees an "embodiment of an unconquerable soul," but he tells also in quaint fullness "the story of imperturbable, wealthy, happy, helpful, impregnable Aunt Lucy." And for each of his thirty-nine essays, as for the two "books," Mr. Locke has a quotation from his poets that make of his volume a thesaurus of this sort too.

Leonard Hall's *Possum Trot Farm: An Ozark Journal* is still further evidence of the daily paper's possibilities for serving its readers with enduring thoughts. Don Thompson, editor of the St. Louis *Post-Dispatch's Everyday Magazine*, in his foreword to his colleague's book declares "there is no doubt that much of the best country writing — whether it deals with nature, wildlife, conservation or the farm — appears in daily newspapers." *Possum Trot Farm* deals with all these subjects and merits such praise. One of its essay-chapters, entitled "Old Favorites Line the Farmhouse Shelves," is a winter night's contemplation of country books that Mr. Hall and his wife enjoy "because the books are written by people who like the things and do the things which we like and are doing." Mr. Hall's own book belongs on such a shelf, for it, too, is written by one who is doing the things he discusses, living in his "year-round country home" and gathering himself the experiences he shares with his *Post-Dispatch* readers and with those who now read his book. "Perhaps the contemplation of a pair of Carolina wrens or a cardinal singing in the top of a white oak tree, or of a wildflower growing in a sun-drenched field," he suggests, "may lead some of us back to an understanding of eternal verities — both natural and spiritual — in which alone lies our salvation."

In one paragraph near the close of his book Mr. Hall sums up his living, and he comments, too, on his journal.

"Each spring," he writes, "we've watched the songbirds return — and the waterfowl following their trackless flyways to northern nesting grounds. Summers have been seasons of plowing and hoeing, with occasional jaunts into the Ozark country to fish the Current or Jack's Fork. Canning, sausage making, the honey harvest and days afield with old Mac have filled our autumns to overflowing. Winter's small adventures have to do with the first fall of snow and hikes across white fields to read the story left by coon and fox and cottontail. All these have been faithfully recorded in our country journal, yet on looking it over I am surprised at how far afield it has wandered. Out of a country boyhood and more than a score of seasons afield with rod and gun have come not only tales of Ozark adventure, but also a deeper understanding of nature's laws, of the way in which man has violated those laws and the penalties exacted for such exploitation, and of how we can — in some degree at least — make amends. Coming again into close contact with the land has brought a deep realization that here, in the health of our fields and forests and streams and in living at peace with nature,

From a Country Hill

By EMMA GLASER

If you have watched with inarticulate delight,
From the free vantage of a country hill,
The change from sunset into twilight, dusk, and night,
Then you have felt how deep peace is, how still.

You see the benediction of the afterglow
Accent each detail of the widespread scene,
Before the twilight sky, rimmed with pink, rose, and mauve,
Securely cups your world, safe and serene.

Then dark, pricked there—and there—and there by neighbor's light;
Bright stars; and silence stabbed by cricket song.
You feel cares slip away. Here on this hill tonight
The tang of earth is clean, the pulse is strong.

lies the hope for mankind's future."

Two of the forty-three articles that Mr. Hall has made into the chapters of his book deal with excursions into the wildness of Current River and with the Ozark wildlife there. Benton MacKaye has written of our modern environment as being properly a trinity—urban, rural, and wild. Leonard Hall, with his metropolitan employment, his country living, and his Ozark wilderness excursions, seems to live this triune fullness, and he shares it well with his readers. "On winter evenings," advises Harry J. Owens in an introduction, "build up the fire on the hearth, pour yourself a glass of cider, bite deep into a red apple, and let this book carry you close to some of the things of this life that really count." This is good advice.

It is, I believe, something added that makes an almanac out of a calendar, and it is much that Aldo Leopold has added in making for us his *Sand County Almanac*, which he completed just before his life was cut short two springs ago in what seemed its prime. He has left us many contributions, and this volume called completely *A Sand County Almanac and Sketches Here and There* is, as it were, a last testament. We shall be discussing it again, but we note now for its seasonal interest that the first of the book's three parts is this almanac — a collection of descriptive and reflective essays written as from the shack up in Sand County, Wisconsin, where with his family he found refuge "from too much modernity." (The volume's second part comprises the "Sketches Here and There" telling of episodes "over the continent and through forty years" and presenting "a fair sample of the issues that bear the collective label: conservation." The concluding part presents four great philosophical essays — "Conservation Esthetics," "Wildlife in American Culture," "Wilderness," and "The Land Ethic" — under a collective title "The Upshot.") The whole book is in effect a reappraisal of "things unnatural, tame, and confined," a reappraisal of these "in terms of things natural, wild, and free," and a proper introduction is provided by the "shack sketches" arranged by months into "A Sand County Almanac."

A Sand County Almanac and Sketches Here and There. By Aldo Leopold. New York: Oxford University Press. 1949. 226 pp. (5¾ by 8½ in.) with 33 illustrations (7 full-page) from drawings by Charles W. Schwartz. $3.50.

Countryman's Year. By Haydn S. Pearson. New York, London, and Toronto: Whittlesey House, McGraw-Hill Book Co., Inc. 1949. xii + 193 pp. (6¼ by 9¼ in.) with foreword by Dorothy Canfield Fisher and 29 photographs. $3.50.

Halcyon Days and The Year at the Whistling Post. By Walter Locke. Yellow Springs, Ohio: The Antioch Press. 171 pp. (5¾ by 8 in.), with foreword by Joseph Myers. $3.

Possum Trot Farm: An Ozark Journal. By Leonard Hall. St. Louis, Mo.: The Caledonia Press. xii + 163 pp. (5¾ by 8½ in.), with foreword by Don Thompson, introduction by Harry J. Owens, and 32 illustrations (12 full-page) from drawings by George Conrey and other artists of the *St. Louis Post-Dispatch*. $3.

Weavers of Webs

Webs in the Wind. By Winifred Duncan. New York. 1949. The Ronald Press Company. 387 pages. Illustrated. $4.50.

Winifred Duncan has an avidly inquiring mind, a sense of humor and a facile pen. These combine to provide a thoroughly fascinating volume, the latest addition to Ronald's excellent Humanizing Science Series. Miss Duncan has no patience with people who think of spiders as ugly, dangerous or even disgusting creatures. To her they are master architects, superb engineers and zealous and valuable workers. And after one has read this story of her adventures with the web-makers it would seem impossible to find anyone retaining an aversion for the spider. The author spied on the life habits of the web-weavers, delved into their mastery, and found among them many fascinating personalities. She writes about them in friendly and understanding fashion without excursions into any objectionable anthropomorphism. It is no orthodox book on spiders but one that is at once informative, charming reading and an invitation to extend Miss Duncan's observations.

Quetico-Superior Book

Whither Away? By E. F. Cary. St. Paul 1, Minn. 1949. E. 1200 First National Bank Bldg. 131 pages. Illustrated. $2.50.

This volume tells in intimate style the personal experiences gathered from more than a generation of travel in the famous Quetico-Superior wilderness canoe country of northern Minnesota and adjoining northwestern Ontario. The stories are told as seen through the eyes of a true wilderness lover and one who has a keen concept of the values that wilderness contributes to the welfare of mankind.

Science-Civilization

Science and Civilization. Edited by Robert C. Stauffer, with contributions by Richard P. McKeon, Lynn Thorndike, Max Black, Ernest Nagel, Philip E. LeCorbeiller, Farrington Daniels, Oswei Temkin and William F. Ogburn. Madison, Wisconsin. 1949. University of Wisconsin Press. 212 pages. $2.50.

This interesting book is based upon a series of addresses delivered to the History of Science group at the University of Wisconsin by a distinguished group of scholars able to weigh both the technical and the general implications of the contributions of science to the progress of civilization.

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IN THIS ISSUE

January, 1950 Vol. 43, No. 1

Snow Geese ... Fredric Sweney Cover
Nature in Print ... Howard Zahniser 2
From a Country Hill (Poem) ... Emma Glaser 2
Contents Noted ... R.W.W. 7
Big Bend — Last Frontier ... Victor H. Cahalane 9
Father of American Herpetology ... Romeo Mansueti 16
Window Display (Poem) ... Clarence Edwin Flynn 20
Plants from "Down Under" ... L. O. Huggins 21
Perseverance unto Death ... M. E. Beatty 24
Some Common Woods ... E. Laurence Palmer 25
What About CVA? (Editorial) ... 33
Wildlife Parks of East Africa ... Dan Lincoln Thrapp 34
America's Problem-Fish ... Montgomery Phister 38
Lily of Many Names ... Betty H. Huntress 40
Terrariums as a Hobby ... Elizabeth Bachmann 41
Bittersweet (Poem) Margaret Mitchell Berryman 43
Sporting Proposition (Poem) ... Avery Giles 43
The Heavens in 1950 ... Isabel M. Lewis 44
Two People, Planting (Poem) ... Daniel Smythe 45
Camera Trails ... Edna Hoffman Evans 46
The School Page ... E. Laurence Palmer 48
Under the Microscope ... Julian D. Corrington 54

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North American Man

Ancient Man in North America. By H. M. Wormington. Denver. 1949. Denver Museum of Natural History. 3rd edition. 198 pages. Illustrated. Paper bound, $1.62; cloth bound, $2.62.

Published originally ten years ago, this popularized account of the discoveries pertaining to early man in North America was received with enthusiasm, necessitating a second edition in 1944. Now comes this third edition, so extensively revised as to constitute virtually a new volume. It presents an up-to-date account of the most ancient stone industries, the methods that we have for dating them, the finds of human skeletal remains that may be of some antiquity, and many theories as to the peopling of the New World.

Evolution

The Meaning of Evolution. By George Gaylord Simpson. New Haven, Conn. 1949. Yale University Press. 364 pages. $3.75.

This book answers such questions as what has happened in the course of the history of life; how its changes have been brought about; what meaning these changes have in terms of the nature of man, his values, ethical standards and his possible destiny. The author is Curator of Fossil Mammals and Birds at the American Museum of Natural History, and this book is based on the Terry Lectures delivered by the author at Yale University in 1949. It is the result of a quarter-century of research.

Just Listed

Three books recently received for review from Philosophical Library are not quite "down our alley," but we are happy to list them since they may interest some of our readers. *Twilight in India,* by Gervée Baronete, is a discussion of Hinduism and the caste system and what it has done to India. *Scientific Autobiography and Other Papers,* by Max Planck, is a collection of papers by this late great physicist. *Letters to My Son,* by Dagobert Runes, is a collection of penetratingly philosophical comments on life and ethics.

Probability

The Theory of Probability. By Hans Reichenbach. Berkeley and Los Angeles. 1949. University of California Press. 492 pages. $12.50.

This is an inquiry into the logical and mathematical foundations of the calculus of probability. It is, without question, an important book, but, to one with our unmathematical mind, one look at the complicated and imposing equations presented is enough to frighten us out of our wits. We stand in complete awe of anyone who can make sense out of such things, but we are slightly reassured by a sentence in the introduction which says: "Wealthy noblemen, who spent their ample hours of leisure in the excitement of gambling, supplied the stimulus that induced mathematicians to construct the mathematical theory of probability." From this came the scientific concept that is brought to its greatest fruition in this volume.

Civic Annual

American Planning and Civic Annual. Edited by Harlean James. Washington, D. C. 1949. American Planning and Civic Association. 180 pages. $3.00.

This is the annual record of civic advance in the fields of planning, parks, housing, neighborhood improvement and conservation of natural resources. It also includes the addresses delivered at the Citizens Conference on Planning held at Oklahoma City.

Q-S Geography

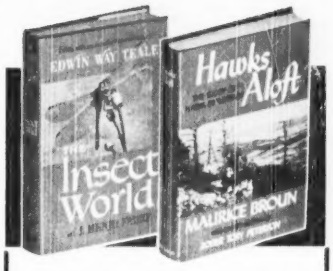
"Geography of the Quetico-Superior Country" is the title of the latest pamphlet to be issued by The President's Quetico-Superior Committee, 919 North Michigan Avenue, Chicago 11, Illinois. Copies are available on request. This bulletin is a reprint of the last published article by the late Dr. Wallace W. Atwood, and was printed in the *Canadian Geographical Journal.* Through this and earlier bulletins and pamphlets the Committee is doing a notable job of informing the public about the tremendous value of the Quetico-Superior region, and indicating the wisdom of the movement to preserve it in its natural state for posterity.

Southern Pines

One of the most effective conservation documents to come to hand recently comes from the International Paper Company, Southern Kraft Division, Mobile 9, Alabama. This is a booklet entitled "How Money Grows on Trees" and done in excellent fashion, according to the "comic" book formula, in color. Its object is to further the crop production of southern pines as a part of a well-rounded farm management program. Corollary to the booklet is a folder containing practical suggestions for teachers. Both publications may be had on request to the address above, if you will mention that *Nature Magazine* called these to your attention.

Southern Appalachians

Anyone who knows or who wishes to know the southern Appalachian region will find pleasure in an attractive booklet entitled "Mountain Rise: Nature's Year in the Southern Appalachians" by Walter W. Hoffman. The main part of the title is taken from the name the author has given to his farm in westernmost North Carolina. From this vantage point, this keen observer of Nature takes the reader through the year of bird, flower, tree and natural beauty in this country. Copies of the booklet are available from the author at Route 2, Murphy, N. C., for forty cents.



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by

MAURICE BROUN

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WOODPECKERS THEN AND NOW

By W. L. Mcatee

In extension of the remarks of John F. Wilson in the October issue, times certainly change, and with them opinions as to birds as well as other things. Reflecting the lore of his age, Thomas Pennant in an account of the downy woodpecker in his Arctic Zoology (1785) wrote: "The Woodpecker tribe is the most pernicious of all the birds of *America*, except the Purple Grakle; but this little species is the most destructive of its whole genus, because it is the most daring. It is the pest of the orchards, alighting on the apple-trees, running round the boughs or bodies, and picking round them a circle of equidistant holes. It is very common to see trees encircled with numbers of these rings, at scarcely an inch's distance from each other; so that tree dries and perishes" (p. 274). Evidently the same habit was attributed to a closely related and an almost equally familiar species, as he adds: "The hairy woodpecker is very destructive to apple trees in Carolina" (p. 274).

The downy, and as a fairly close second, the hairy, woodpecker, are confident birds that go about their business without paying much attention to mankind. Hence they are commonly seen, and it is little wonder that they have been blamed for the systematic puncturing of the apple and other trees, which they were plainly seen to peck. However, there was also an elusive visitor, a bird that made few sounds and was ever careful to shift around a tree, keeping out of sight of possible observers. This was the yellow-bellied sapsucker and its evasive action paid, for it was only in fairly recent times that blame was properly placed on it for the damage commonly charged to the more conspicuous downy and hairy woodpeckers. The sapsucker ranges from coast to coast and has a relative of similar habits in the northern Rocky Mountain region; it is now safe to say that all of the girdling of branches and trees, showing more or less regular series of holes that are cut clear through the bark and expose the sapwood, is the work of these birds. They devour the cambium or tender inner bark, revisit the pits to drink sap, eat insects attracted to the scene, and in general "lead the life of Riley," there never being any food shortage for them. Branches and trees sometimes die as a result of sapsucker workings, and, in timber, many defects result from staining traceable to the holes and to knotty blemishes produced in the healing or growing over of the punctures. Sapsuckers do not consume as many tree pests as do most of our woodpeckers and hardly compensate for the damage they do.

As there was much delay in understanding the role of these harmful birds, so were the habits of the beneficial woodpeckers long misinterpreted. Thus in his discussion of the white-billed woodpecker, now called the ivory-billed, Pennant borrowed from Mark Catesby (1731) to assert that "They are very destructive to trees; for they have been known to cut out a measure [i.e. a bushel] of chips in an hour's time" (p. 268). And in his account of the pileated, adapting Pehr Kalm's report (1753-61), he said, "When the maize begins to ripen, this and other kinds make great havock, [by settling on the heads, and picking out the grain; or making holes in the leaves [husks], and letting in the wet, to the destruction of the plant" (pp. 269-270).

It was not understood that in excavating wood these expert drillers were in search of destructive tree-borers, or possibly were making nest-holes, and that in other case the laborer was worthy of his hire. Both the pileated and ivory-billed woodpeckers are voracious consumers of wood-borers and other tree pests and their cutting into trees to get them should no more be condemned than is incision of the human body by the surgeon to remove some injurious element, say a diseased appendix. In the normal course either wound heals and the patient is much better off for the operation.

Damage to corn by the pileated woodpecker was surely restricted to pioneer times as this species retreats with destruction of the forest and keeps to the largest remaining woodlands. Woodpeckers less dependent on mature forest invade cornfields but usually do no serious harm. Some sample cultivated fruits and one of them was charged with both delinquencies by Pennant. The red-headed woodpecker, he avers, again paraphrasing Kalm, "Feeds on maize and apples; and is a most destructive species. They pick out all the pulp, and leave nothing but the mere rind . . . They were formerly proscribed; a reward of two pence was put on their heads; but the law was repealed" (p. 272).

Such damage in the East was largely an accompaniment of the era of settlement. The cabin in the clearing, with its cultivated fruits and grains, was a focus of depredations by creatures of the surrounding woodland. Their numbers were out of reasonable proportion to the scanty crops and they were a real menace that had to be combatted. One interesting means of controlling damage to cherries by the redhead was to erect a pole, probably in most cases a trimmed sapling (with its base buried in the ground) through or near a cherry tree. A task for the boys of the family was to stand (or lie) by and when a woodpecker alighted on this convenient perch, give the pole a sharp blow with an ax or maul. This would cause a snappy vibration clear to the top that would stun the woodpecker, which falling to the ground could be disposed of as the boy saw fit.

As time went on and clearing became joined to clearing, fruit and grain gained such ascendancy over the decreasing predatory attack that in most regions the injury became insignificant. Where tempting food supplies are near good shelter, damage may be done even at the present day, but in general, woodpecker destructiveness (except of sapsuckers) is a thing of the past. We attract the birds to our feeding stations, enjoy seeing and studying them, and are far from having reason to consider them "the most pernicious of all the birds of America."

KINDNESS OF A CROW

By Inez Storie Carr

A long black stream wound diagonally across the tinted morning sky. Crows! From the kitchen window I watched the seemingly endless coming of the big black birds, leaving their winter roosts miles away to the west and visiting the peanut fields a few miles north east from our town. Every morning during the winter months they made this trip and each evening returned by the same sky road. The formation was steady and undeviating.

One morning as I watched I saw two crows leave the company and wing their way directly toward our garden. One, a small, broken-legged, rough-feathered, scrawny bird, alighted on the ground where a few scraps had been cast. The other, an extra large, sleek fellow, settled himself on a limb overhanging the garden. From here he kept watch while the crippled crow fluttered here and there seeking food. Every now and then the big crow would fly down and flip over an orange peel or a clod of earth, while the cripple, lying on his side, peered and picked at what ever came to light.

This went on for about an hour. Then the husky bird set up a loud cawing and the weak one rose on his wings. Together they went back toward the roost. I watched them until they disappeared over the distant oak tops. I could well imagine the big fellow making sure that his charge was comfortably perched for the day, and then, his mission accomplished, winging his way, alone, to join the peanut feasters.

Collaboration

From S. M. Pattee of the Biology Department, Roosevelt High School, Cedar Rapids, Iowa, comes an interesting example of collaboration on the part of several school departments. It is a little bulletin entitled "The Amphibians of Linn County, Iowa." The Biology Club of the school gathered the material. The English department stepped in to help with the text. The Art department lent its aid by providing the illustrations. Finally, the Printing department put the whole bulletin together in attractive form. By such cooperative effort we venture to say that more people have been introduced to the amphibians of the region than otherwise could have been the case. This is a suggestion to other schools. Copies of the booklet are available at 25 cents from the address above.

Contents Noted

One of our readers in Providence, Rhode Island, writes that she was listening rather idly to a news broadcast when she pricked up her ears at a story the commentator was somewhat gleefully telling. In the Maine woods a man "was walking along a road at the edge of the wood when he saw a big buck threading his way among the tall bushes that bordered the road, and evidently not yet startled by the nearness of a human being. The man picked up a thick stick and crashed through the underbrush, quickly enough to reach out and give the buck a good belt over the head with the stick. The buck reeled, and then sprang away and started to run. It took quite a chase before the man caught up with the buck again, but the animal had been wounded and a second belt on the head brought him down. And so, concluded the commentator gaily, "the man had venison for dinner." Our correspondent expresses what she fears is a vain hope that this "sportsman" overloaded his stomach with venison and was violently ill. She adds: "If the man had done that to another man, someone who had not molested him, and, taken by surprise, had been unable to defend himself, he would spend years behind bars, or worse, for killing. But this was just a buck: a proud, graceful deer in the woods, so perhaps the killing, and the method, did not matter much. What do you think?" We think that such incidents as this are a sad commentary on our alleged civilized progress, and that the radio commentator who found pleasure in the telling of the story is still in a primitive stage, too.

What the destruction of war, with its disruption of scientific and economic progress can mean, is graphically and tragically emphasized in its effect on the forestry program in the Philippines. When peace came to the Pacific it found a shattered situation in the Philippine Islands. Before the war their forestry administration had been built up to a technical force of 589 men. Of this force 384 technical men were left to administer an area of 17,500,000 hectares. War wrecked most of the reforestation work that had been done. Both national parks and forest reserves were badly damaged. Most of the forestry division's facilities, buildings and equipment were destroyed. The forestry library was wiped out, and, worse, the invaluable results of forty years of research in record form was a total loss. Philippine forestry has had to start again almost from scratch. This is a sidelight on the effect of war that most people do not see, but it is multiplied, world-wide, wherever science joins with economics to manage wisely a natural resource.

Conservation and education of mankind to a proper appreciation of his relationships to and responsibility for the things of Nature around him, have been life-long goals of C. M. Goethe of Sacramento, California. He and Mrs. Goethe have traveled widely, always with inquiring minds. Here at home, however, Mr. Goethe has found startling evidence of man's abuse of his resources in the record of wells sunk on a string of ranches that he operates on the floor of the Sacramento-San Joaquin Valley. For example, in 1922 he sank three wells on one property. A seemingly inexhaustible supply of water was available at between twenty-five and fifty feet. At later intervals six more wells were sunk, and, in 1949, a tenth. This last well went down more than three hundred feet to reach water. The first three wells are dry, and the others have had to go deeper. Water, of course, ranks high in California's problems, and Mr. Goethe points to the hills, where, in the early part of the century were magnificent virgin sugar pines guarding the watersheds. Here and there a lumber company cut on a crop basis, assuring continued yields and allowing the forest to serve its watershed function. But most lumbermen cut clean and burned the slash, and with it the natural, spongy cover of the forest floor. Rainfall washed the soil to the bare rocks and the waters rushed away. It was no longer being stored, any more than it was being stored by the denuded mountains of Korea and North China, where Mr. Goethe recalls squatting in a chairless room, warmed by the only available fuel — weed stalks. He wonders when weed stalks will be the only fuel of the Sacramento-San Joaquin Valley.

It must be mighty discouraging, at times, trying to control Nature and make her creatures fit man's convenience. Now, it appears, entomologists are discovering mosquitoes that just grin at clouds of DDT and go merrily on their ways. Florida coastal salt marsh areas had been treated to the insecticide in oil solution for five years. The result was few mosquitoes. Then, all of a sudden, some of these buzzing pests turned up quite immune to the high-powered poison. Houseflies that had built up a similar immunity have already been discovered. Now the search is for stronger insecticides, suggesting a vicious circle.

Note on the progress of education in Allegany County, New York: The county agricultural agent has a program designed to educate high school students about methods of trapping and doing away with foxes. Students are assembled for a demonstration that requires use of a trap and a young, live fox. While the fox is struggling for its life its paw is placed between the jaws of the trap. Then the animal is choked with a tight cord around its neck, and the demonstrator's foot is placed firmly against the animal's heart until the fox stops breathing. This is a procedure put on before boys and girls. Assuming that foxes may be locally so numerous as to constitute an economic problem, and therefore require control, we are unable to see the justification for such an addition to the curriculum of any school, rural or otherwise. R.W.W.

PHOTOGRAPH BY GEORGE A. GRANT

The mouth of Santa Elena Canyon in Big Bend National Park. Here the Rio Grande River breaks through the Mesa de Anguila. The cliff on the left is in Chihuahua, Mexico; the one on the right is in Texas.

PHOTOGRAPH BY GLENN BURGESS

The rugged terrain of Big Bend National Park as photographed from Lost Mine Peak. This scene is of the Casa Grande Basin.

Big Bend — Last Frontier

By VICTOR H. CAHALANE

Soon Big Bend National Park will be officially dedicated as a member of our family of National Parks, although it is already a member of that family in fact. In anticipation of that event we asked Victor Cahalane to tell our readers the story of Big Bend. This is the story of a great biologic unit; a tremendous outdoor Nature laboratory.

Big Bend was sometimes called Bloody Bend in the early days — and for good reason. It was haunted by Spanish explorers, Comanche Indians, Apaches, rustlers and outlaws. They left their blood, and names like Murderers' Canyon, Dead Horse Mountains and Lost Mine Peak.

The Spanish were in search of silver and gold. The Indians raided the Mexican settlements and brought back cattle, poultry and children. The Mexicans, under Spanish leaders, retaliated from time to time. During the 1850's a chain of United States forts was built along the Rio Grande. This reduced the raids, although the Indians were not completely subdued until twenty years later.

Subsequent killers like Old White Lip, Greasy Bill, Pancho Villa and Black Jack Ketchum have been eradicated. But Big Bend remains much as it was in the old days. It is our last frontier; wild, rugged, remote. In the most primitive and distant part of the region lies Big Bend National Park. No railroad approaches it. It consists of more than a thousand square miles of mountain, desert and canyon. Locked on three sides by the big bend of the Rio Grande, it is bounded on the fourth and eastern side by the Dead Horse Mountains.

NATIONAL PARK SERVICE PHOTOGRAPH

View of the park from Emory Park, the highest point of the Chisos Mountains; Standing at this spot, at 7835 foot elevation, one is looking northeast to Casa Grande Peak at the left and to Lost Mine Mountain.

The fifth, or northwestern, side is guarded by the Santiago, and the red-colored Rosillos and Christmas Mountains.

Most of Big Bend National Park is a desert that bursts briefly and gloriously into color when a rare rainstorm brings acres of dormant seeds into flower. Parts of the desert, however, are badlands eternally colored with the purples, mauves, yellows, reds, white and pinks of the Painted Desert.

In the center of the great still desert rise the Chisos, or Ghost, Mountains. Castellated walls give an effect of ghost-like draperies. Jagged tops and pinnacles heighten the eerie appearance. The highest peak is nearly 8000 feet above sea level, and considerably more than a mile above the desert. From the South Rim of the Chisos, one has a breath-taking view. The mountain falls straight down in a sheer cliff to the desert below. The Rio Grande becomes a silver ribbon and, if it is sunset time, the face of the Sierra del Carmens in Mexico is dyed a brilliant red. On a clear day, one can look a hundred miles into Mexico, or along the Texas border.

The Mexican government hopes to have a similar wilderness park around their even higher mountains — the Del Carmens and the Fronterizas. This would be joined to our park by a bridge across the Rio Grande. The two parks would be known as an International Peace Park, and would promote a greater understanding and friendship between the two nations. Our one international park at present is the Waterton Lakes-Glacier International Park, which lies on the borders of the United States and Canada.

The Rio Grande is deceptively mild much of the time. It is so low and sluggish that an early rancher claimed that he could drive it for miles with a horse and buggy during the "dry" season. At other times the river is a mad whirling torrent. It has flooded plains and ploughs through the hearts of mountains. Its three

The strange formation in the center distance is known as the Mule-Ears. The photograph is taken from a spot on the mesa north of Johnson's Ranch.

PHOTOGRAPH BY GEORGE A. GRANT

NATIONAL PARK SERVICE PHOTOGRAPH

The rock that looks like an inverted boot, seen a little left of center, gave this canyon the name of Boot Canyon. Crown Mountain lies beyond. Tree-clad slopes give a more than usual softness to the region.

most spectacular canyons are Santa Elena, Mariscal and Boquillas.

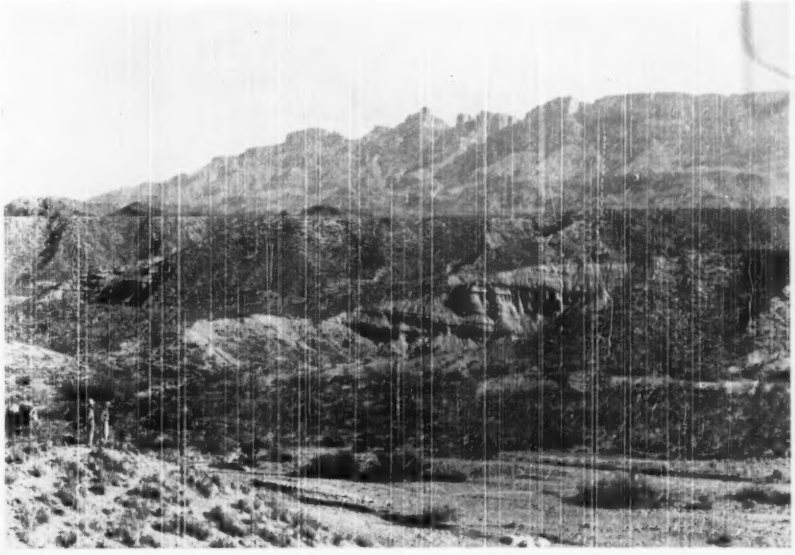
At the mouth of Santa Elena, the river emerges suddenly from the mountain. It makes an abrupt bend into view, having cut towering walls about 1500 feet high, for an 18-mile stretch. The passage is so narrow, and the walls so steep and high that parts of them are never reached by sunlight. Their ragged tops form turrets, castles and giant needles.

Few people have ever dared to navigate any of these three canyons. When the water is low, boats have to be tugged and hauled over fallen boulders as big as small houses. It took one exploring party three days to get their boats over a rock mass. Sudden storms, without warning, will turn the rapids into an army of angry demons smashing boats and people to bits against the jagged rocks and limestone walls. There is practically no escape. In most places the walls cannot be scaled.

A few intrepid young men have attempted to swim Santa Elena canyon during the dry season and have been drowned. I know of only two who have been successful. Using ropes, they climbed over boulders where the rapids were too dangerous. They wore swim suits, heavy hats, knee pads, tennis shoes, and carried ropes and inner tubes!

The colors of canyon and mountain walls are changing constantly with the shifting light and shadow. The various hues, fissures and faults tell the story of a hundred million years. Even a layman can read the writing on the wall. Each line of color and break writes a new sentence or paragraph.

A hundred million years ago Big Bend was covered by a mighty ocean that probably stretched between what we now call the Atlantic and Pacific coasts. After a million years or so it began to recede, leaving mountains of limestone deposits. During the next several million years, the wind and rain wore these lofty mountains down, almost to the level of the desert.



This is the Sierra del Carmen in Big Bend National Park as seen from the south of Boquillas, Coahuila, Mexico. The mountains have an architectural look.

PHOTOGRAPH BY GEORGE A. GRANT

PHOTOGRAPHS BY OMER E. SPERRY

Drooping juniper, one of the more interesting trees of the Chisos Mountains. This species is recorded only for these mountains and the mountains of adjacent Mexico. It is frequent in the canyons, and occasionally develops into well-formed trees on the mountains' lower slopes. At the right is long-spurred columbine, a unique form of the Southwest, frequenting moist canyons in the Chisos. The spurs are from four to six inches long and the flowers are a lemon yellow color. Below, right, is yellow-flowered pitahaya, a cactus that produces striking, large, yellow flowers. The plants are usually single, but may form clusters of several stems. It is widespread throughout the lower desert scrub areas.

Once again the ocean advanced and covered the remains of the mountains. Slowly deposits of marine life and sediment, blown and washed in from surrounding country, began to build up new mountains under the sea. The bottom of the ocean heaved and tilted upwards from subterranean pressure. The water receded further and further. Swamps and swamp vegetation appeared. Dinosaurs grew bigger and better. Great forests arose and fell. Coal beds formed.

Volcanic ash seems to have blown in from distant regions and forecast the end of the Dinosaur Age. Then the earth heaved and cracked. Limestone, long since covered by clays and sand, was thrown up to form the beginnings of the mountains that border Big Bend National Park. Volcanoes in the bowels of the earth sent rivers of molten rock boiling up through the surface to fill the cracks and make domes. This was only the start. A long period of quiet followed, as if the earth were girding its loins.

Then the whole country was turned into fire, smoke, molten lava and earthquakes. All Hades broke loose. Volcanic ash and rocks were blown out of the craters and piled up 2000 to 3000 feet high to form the foundations of the Chisos Mountains. Again and again the country was covered with sheets of black lava.

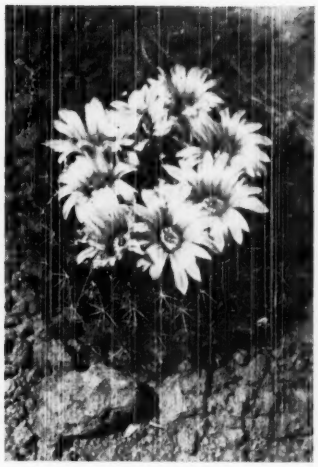
Millions of years have passed since then. But there has been no more construction of land. Continuous destruction has prevailed. The earth has heaved and cracked. Ancient mountains have been raised higher, tilted, even turned upside down. The desert floor is several thousand feet lower.

The Rio Grande has ploughed its way through the depths of mountains. At least once it seems to have become dammed and formed a great fresh water lake

that has long since disappeared. The soft rock of the mountains has been washed and blown away, leaving naked cliffs to tell their story.

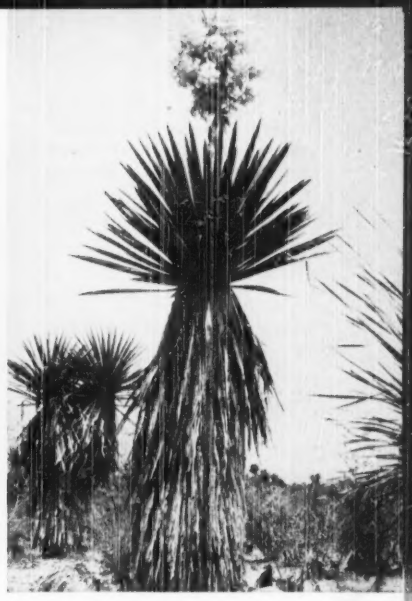
Fossil clams, oysters, sharks and many other relics of the prehistoric sea have been found on the desert

Century plant or agave, a spectacular plant in the valleys and on the slopes of the Chisos Mountains. It grows and stores its food in its thick, fleshy leaves for about 20 years before blooming. The parent plant dies after blooming, but has usually sent out several offsets, some of which develop into normal plants which continue the cycle.



PHOTOGRAPHS BY OMER E. SPERRY

Pin-cushion cactus, a low-growing, dark green cactus of the desert scrub areas. The flowers are yellowish to brownish, tinted with red. Bright red, club-shaped fruits remain on the plants for several weeks. The fruits are called "Chilitos" by the Mexicans because they resemble red peppers.



The giant dagger, a large yucca, is abundant in Dagger Flats of the Dead Horse Mountains. Plants are scattered across the desert scrub area toward the Chisos Mountains, with a few specimens in the valleys of the Chisos proper. This species forms imposing "yucca forest" which is extremely beautiful during the blooming season.

and in the mountains. In those days a clam was a clam was a clam, as Gertrude Stein would emphasize it. Some of their fossil, thick-ribbed shells are four feet long and three feet wide. An occasional "pearl" must have been as big as a street light! The remains of dinosaurs and trees, which flourished so long before the existence of man, are excavated now and then. Petrified logs composed of agate, amethyst and jasper, are ten feet in diameter.

A fascinating technical book about the geology of Big Bend will soon be published. It is written by two noted geologists, Dr. Ross Maxwell, who is now superintendent of Big Bend National Park, and Dr. John T. Lonsdale, Director of the Texas Bureau of Economic Geology.

Treasure hunters are still exploring abandoned silver mines, and looking for "lost mines" in Big Bend. According to legend, the "lost mines" were sealed by fleeing Spaniards or dying Indians.

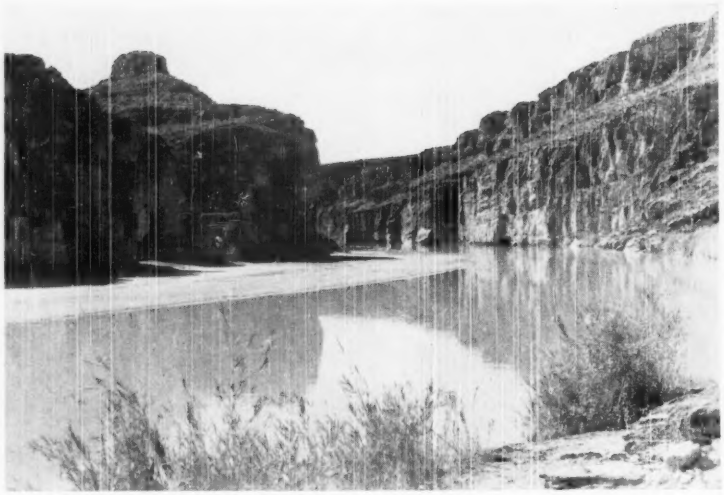
Lost Nigger Mine has created more publicity and fantasy than any other lost mine in Big Bend. A Seminole Indian was supposed to have discovered it sixty years ago. Like the Hope Diamond, it seemed to carry a curse. The Indian disappeared soon after his sample of ore had been assayed. Four well known and respected men in the Big Bend area reported later that they had located it. From that day on, every man who saw it died before he was able to secure the treasure. Those who claim they have inherited the directions for finding it, apparently do not take the risk of following them, thus taking the chance of premature demise.

Carved by wind and rain from the lava tops of the Chisos, the stone likeness of Apache Chief Alsate reclines against the sky. His head with fluted headdress is raised, watching Lost Mine Peak. He is supposed to be guarding many Apache treasures, including another lost mine. Once a year, according to legend, a clue can be found for the search of it!

"Cross the Rio Grande into Mexico at Easter dawn and stand in the doorway of the ancient Spanish mission of San Vincente. Face the mountains of the United States. As the sun rises on this holy day over the Del Carmen Mountains behind you, the rays of the sun shine directly into the opening of the lost mine."

If the sun is not shining, you must, of course, wait another year. No one yet has been able to follow the sun rays to the lost treasure.

Bats, guano, and the relics of Indians are found in some of the many caves of Big Bend. The first Texans — the red men — are called the Pre-Basket Makers. Ancient Indian mats, grass sandals, rabbit skin blankets, bone and wooden implements, "needles," "fountain pens" for picture writing on the rocks, cactus spine hooks, pipes, and the bones of the condor, long extinct in the park, have been found. On the Chimneys — great rocks of the Chisos — are picture writings that may have been made about the time of Christ. Very old Indian pit houses have been excavated, and truck loads of relics carried off from the Big Bend area outside of the park boundaries as they are at present.



The Rio Grande River as it emerges from the first canyon up the river from the Boquillas. Left is Mexico; right is Texas.

PHOTOGRAPH BY GEORGE A. GRANT

Camels once lived in Big Bend. It was not their idea, of course. They were imported from Africa for army patrol duty on the desert during the later Indian raids. The camels could carry 500 pounds of equipment thirty miles a day, and go without water for several days at a time. But after a year or so, at the beginning of the Civil War, they were abandoned as impractical. For twenty years they roamed wild, and then disappeared.

Of all the great national parks, Big Bend is the only one to have an entire mountain range to itself. Surrounded by desert, the mountains form a complete biologic unit. Provided with both winter and summer habitat, and more or less imprisoned by natural barriers, the mountain-dwelling mammals remain in the park the year round. In other national parks, even larger ones, many animals must wander out of the park for winter food, or do so anyway because there are no natural barriers.

There are more than sixty species of mammals in Big Bend National Park. The mule deer is fairly common from the desert up to about 5000 feet elevation in the mountains. Above 3500 feet, one finds the white-tailed deer.

When the park was established in 1944, and domestic stock removed, the overgrazed range seemed to be in an almost hopeless condition. Recovery, however, was astonishingly rapid. As a result, in 1948 and 1949, the Texas game authorities brought in about 100 antelope from over-populated ranges. These animals, which had been exterminated in the Big Bend by 1920, are once again increasing in their ancestral home.

The mountain sheep were wiped out years ago. It is hoped that this rare animal can be reestablished. Black bears and mountain lions were comparatively numerous in the Chisos until about ten years ago. Ruthlessly shot, poisoned and trapped by stockmen, they have managed to persist only in very small numbers.

Among the other carnivores in the park are coyotes, which are numerous, bobcats, gray and swift foxes, badgers, raccoons and three kinds of skunks. The beautiful little ringtail is the most abundant furbearer, but, being a night walker, it is seldom seen. The Mexican opossum is very scarce, within the park area.

Bands of peccaries, those pig-like animals called javelines, are found on the desert and occasionally in the mountains as high as 6500 feet. They are reputedly vicious, aggressive fighters, but probably would not attack a man; certainly not unless provoked.

Beavers are numerous on the Rio Grande. Since it is a risky business to build dams and stick houses on a stream subject to such terrific floods, they build burrows in the banks. Among the smaller rodents in the park are two species of wood rats or "pack rats," two cotton rats, five kinds of deer mice, a harvest mouse, grasshopper mouse, two kangaroo rats, three pocket mice, two pocket gophers, two ground squirrels and a rock squirrel. Black-tailed jack rabbits are common on the desert and as high as 5000 feet elevation in the Chisos Mountains. Two species of cottontails frequent the thickets from the Rio Grande to the Laguna, or higher in the Chisos.

In the late evenings, twelve kinds of bats hunt for insects and come back to roost in the caves and fissures of the canyon walls. One of them, the big free-tailed bat of Mexico, has never been found anywhere else in the United States.

More than 240 kinds of birds have been recorded in Big Bend and vicinity. Several of these are well known in Mexico, but cannot be found elsewhere in the United States. These immigrants are the blue-throated hummingbird, Couch's jay, dwarf red-shafted flicker, Mexican phainopepla, Colima warbler, and hooded oriole.

More common, but also interesting species, are herons, egrets, the American bittern, nine species of ducks, and eight sandpipers and their relatives. The two vultures — turkey and black — gather at whatever carcasses they can find. Sixteen kinds of hawks have been seen in Big Bend Park, or close by. Six species of owls range the area by night.

The twenty-third bird of prey, and the largest, is the golden eagle. This magnificent bird is killed at every

opportunity outside the park. Pilots with light planes are hired by livestock associations to shoot eagles from the air. Two of these flyers claim to have killed 2000 eagles in two years. Many of these were probably "park eagles."

The "game" birds in the park include scaled quail, Mearns' quail, band-tailed pigeons, western mourning doves, western white-winged doves, and their two smaller relatives the Mexican ground dove and Inca dove.

The small birds are so diversified that only a few groups can be mentioned. Climbers in the mountains will admire the abundant white-throated swifts that roost and nest in fissures of the cliffs. Although almost their equal in flight, the night-hawks nest on the desert. The park is also home to seven species of humming birds, eight woodpeckers and their allies, fifteen flycatchers, eight swallows, the American and white-necked ravens, six wrens, six vireos, about twenty warblers and approximately seventeen species of sparrows.

The most dangerous reptile in the Big Bend is the western diamond rattlesnake. It is bold and rather aggressive. The black-tailed rattler is more abundant and widespread, but is generally inoffensive toward man. The third and last rattlesnake in the park, the eastern rock rattler, grows to a length of only two feet and is retiring in nature. One more venomous snake, the copperhead, is found in the mountains.

The remaining nineteen species and subspecies of snakes of the park are harmless. Those that will be seen most frequently are the red racer, garter snake, and gopher snake. In addition there are nineteen kinds of lizards that flash over the rocks or hide under dry leaves. These include the earless lizards, fence lizards, race-runners, and the sizable alligator or Texas plated lizard.

Even in this desert there are toads and frogs. Spotted toads are found wherever water furnishes this essential of life, while the Rocky Mountain toad and Sonoran toad are more limited in distribution. Gaige's frog, a slender, pale brown amphibian, lives *only* in the Chisos Mountains and nowhere else in the world.

There is fishing every day of the year in the Rio Grande. Ninety-five per cent of the fish are catfish. When a catfish is really hungry, you can probably catch it with a piece of soap. The usual bait, however, is a live minnow. Sometimes goldfish are brought in for this purpose. Or a whole goat may be cut up. The yellow catfish averages more than six pounds, and often weighs thirty pounds. An exceptional one may weigh up to 100 pounds — enough for a Kiwanis luncheon. The channel cat and blue cat are smaller but they frequently weigh more than five pounds apiece. Occasionally fishermen haul in and eat a sheepshead or a smallmouth buffalo fish. Other species, including carp, green sunfish, bullhead or pollywog catfish, and the carp sucker are used only for bait.

Until this area became a national park, there were no fishing regulations. A single fisherman would put out long trot lines with hundreds of hooks on each one. A party of four or five people would catch 500 pounds of fish night after night while they slept on their air mattresses. Power boats invaded spawning waters.

The Share-the-Fish program of the Park Service has established these rules on the Rio Grande: To protect the spawning areas, Santa Elena, Mariscal and Boquillas Canyons are closed to fishing. Elsewhere in the Rio Grande, each person may use two set lines with not more than two hooks attached to each line. Fishing with trot lines and from boats is prohibited. The daily catch is limited to twenty pounds and one fish per person.

There are no permanent lakes or ponds in Big Bend National Park. The only sources of fresh water away from the Rio Grande are about seventy springs. A few of these contain fish which, through isolation, have developed characteristics that set them apart from others of their kind. Two, a red shiner and a top minnow, are unique. For this reason, fishing is prohibited in all pools away from the Rio Grande.

You may have your choice of three climates in Big Bend. Summer, summer-winter, and winter. It all depends on the elevation. This determines the plant life too. Any botanist could be taken into the park blindfolded and, by the first glance at the nearby vegetation, tell how far he was above sea level.

The lower levels, which have only about six inches annual rainfall, are covered with *desert scrub* — creosote bush, yucca, ocotillo, lechuguilla, various cactuses and many other warmth-loving plants. The upper levels of the lower mountains, which are on the boundaries of the park, and the lower slopes of the great Chisos, belong in the *desert grassland* group — largely chino grass and sotol. Above the grassland type in the highest mountains, the Chisos, are the virgin forests. First comes the *pinyon-juniper-oak woodland*. Finally, where the annual rainfall may reach twenty inches, a few of the highest peaks are crowned with *ponderosa pine-Douglas fir-Arizona cypress forest*.

More than 800 kinds of plants grow in Big Bend National Park. They have been described in an excellent book by Dr. W. B. McDougall and Dr. Omer E. Sperry. This is to be published by the National Park Service.

A number of plants are found only in the park or vicinity, and nowhere else in the United States. Some of these rare plants are drooping juniper, giant dagger, Chisos Mountains century plant, hechtia, longspur columbine, bitter cress, and a stonecrop.

Perhaps the most strikingly beautiful of these is the giant dagger. It grows up to twenty-five and thirty feet high. The clusters of white, wax-like blossoms may be five feet long and one and one-half feet across. The leaves are about three feet long. When seen in bloom, the spectacular ten square miles of dagger "forest" is never to be forgotten.

After especially rainy win- (Continued on page 52)

Dr. John Edwards Holbrook as a young man and physician in Charleston, South Carolina. His interest in reptiles was so intense that he soon became more famous for studies in this field than for his medical accomplishments.

PHOTOGRAPH COURTESY OF THE AMERICAN MUSEUM OF NATURAL HISTORY

Father of American Herpetology

By ROMEO MANSUETI

AMERICA's world-wide pre-eminence in zoology had its beginning during the Mexican War era because an obscure Charleston physician, Dr. John Edwards Holbrook, became fascinated with snakes. European impressions of American science during the first third of the 19th century were anything but flattering. On visits to England our scientists were repeatedly embarrassed by the supercilious question: "Who ever saw an American scientific work?"

Dr. Holbrook was the first American to make Europeans sit up and take notice of his scientific achievements. With the publication of the first volume of *North American Herpetology* in 1836, Holbrook laid a cornerstone in American science. When the first copies trickled into European museums, zoologists developed a respect bordering on envy for "Dr. Holbrook of Charleston."

Dr. Holbrook, with the aid of artists to make his illustrations, was the Audubon of the reptilian world. His *magnum opus*, an elaborate history of American amphibians and reptiles, is a zoological classic. It was so far above any previous work on the same subject that even scientists in Europe admitted that hardly anything existed to compare with it. The volumes were pictorially and technically more accurate than anything then published in America.

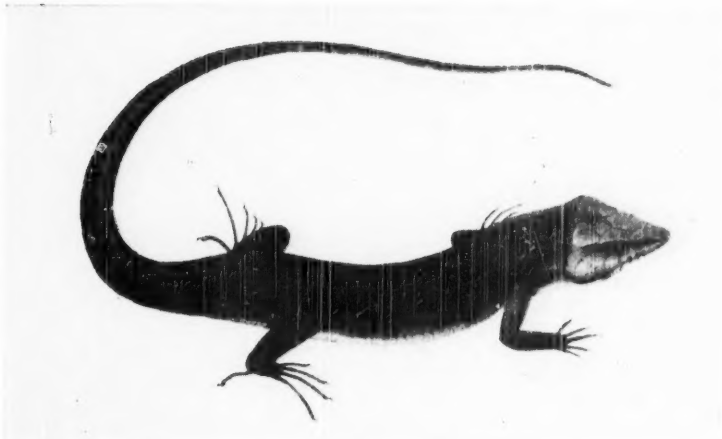
Regarded today as the "father of American herpetology," he sacrificed his fortune and time to study the indigenous snakes, lizards, turtles, frogs, toads, and salamanders of the 24 states. Indeed, his books on North American scaly, shelled and moist-skinned animals have never been surpassed in beauty and size. They are rare collector's items among herpetobibliophiles. His studies of the fishes of the southern States are among the earliest and most important ichthyological contributions in this field of scientific research.

Being a physician, he studied amphibians, reptiles, and fish only as a sideline. In a short time he became more famous for his herpetological researches than for his medical studies. A friend remarked: "He was a man of singularly modest nature, eluding rather than courting notice." His popularity was attested by a fellow-doctor who wrote: "There was something in his manner which was irresistible; hence his patients felt the most entire confidence in his ability to relieve their suffering. . ." In routine matters, however, he was considered by one friend as "a careless man who never took care of anything."

Although born in Beaufort, South Carolina, the home of his mother, he was brought to Wrentham, Massachusetts, in 1794, when only a year and six months old, by his father, a New Englander. Here he spent an uneventful, but crowded childhood, generating an intense interest in Nature. He received his early education there, then attended Brown University, and finally received his M.D. from the University of Pennsylvania in 1818.

At this time Holbrook was only mildly interested in the lower vertebrates. For a short time after graduation from medical school he practiced as a physician with a friend in Boston. His larger and more comprehensive view of his profession, however, forced him to go abroad to seek more scientific training, for America had an appalling lack of it.

Europe was abuzz with great scientific activity when he arrived. Research and interest in the natural and physical sciences excited his imagination. Although he conscientiously inspected the medical schools at London and Edinburgh, he also observed with great care the methods of zoology employed by Europeans. He travelled four years in France, Italy, and Germany to familiarize himself with methods of study and practice



This plate from Holbrook's *North American Herpetology* is of the greater five-lined skink, a familiar southern species painted for Holbrook by the artist, Sera. It is reproduced here by courtesy of the Peabody Institute Library of Baltimore.

there. But his associations at the *Jardin des Plantes* in Paris were the most significant.

Nothing in all his European journey had greater influence on his future life than his stay at this museum, then the center of zoological research in the world. There he worked and became intimate with some of the leading scientists of his day — Achille Valenciennes, French ichthyologist; Andre M. C. Dumeril, French herpetologist and anatomist; Gabriel Bibron, French herpetologist — all students of Baron George L. C. F. D. Cuvier, France's great zoologist, anatomist, paleontologist, and taxonomist.

Since the chief interests of this group were amphibians, reptiles, and fishes, Holbrook was naturally attracted into investigations of these groups. He returned to America with the blessings of his *Jardin des Plantes* friends, full of inspiration and eager to emulate the almost completed project of Dumeril and Bibron — *Erpetologie Generale*, a ten-volume account of all the amphibians and reptiles found in the world.

When the doctor returned to America in 1822, he decided to set up a practice of his own. At the age of thirty, he cooperated with some of the leading doctors in the organization of "The Medical College of South Carolina." He was elected professor of anatomy, which post he held for more than thirty years.

Holbrook, the practitioner, had some peculiarities and eccentricities. His dislike for attending obstetric cases, or for performing any painful surgical operation, was explained by his distaste of seeing persons suffer pain. Even with his accurate knowledge of anatomy he never operated if he could get any one else in whom he had confidence to do it.

He sometimes seemed abrupt to patients who did not know him well, although his manner in the sickroom was described as gentle and kind. If a patient was suffering from nausea and seemed likely to resist the medicine he had just administered, Holbrook frequently, without warning and regardless of bedclothes, would throw half a tumblerful of water into his face and say, "Take that, and don't say anything more about throwing up!" The patient would be momentarily startled, and protest against such treatment; but the nausea would pass off, and the medicine be retained.

When lecturing, Holbrook usually held his audience spellbound. His peculiar talent for description, and thorough knowledge of the structure of the human body and comparative anatomy, made demonstrations instructive as well as delightful to listen to.

During this period his extracurricular research with snakes and their relatives blossomed out broadly. In the early 19th century few men had any idea of what species of snakes or frogs roamed our eastern coast. He undertook the labor of monographing the reptiles of the United States with no one basic reference upon which he could build. The work that most nearly enumerated all of the species known in 1827 was *Genera of the North American Reptilia, and A Synopsis of the Species*, a scholarly dissertation by Richard Harlan, one of America's early physicians and zoologists.

Holbrook's work was not the first of its kind. Most of the familiar forms of the eastern and middle Atlantic States, as well as South Carolina, had already been described, but descriptions and drawings of the creatures were in publications inaccessible to the ordinary reader. And Holbrook hoped to slant his monograph to the layman and the scientist alike.

Europeans accounted for the discovery of many American plants and animals. It was no surprise to Holbrook to find that most of them had already been described by Carl von Linnaeus, the Swedish taxonomist and originator of the binomial system of classification. Dr. Alexander Garden, a medical doctor and botanist residing in Charleston, had earlier supplied Linnaeus with most of the specimens, including the coral snake, rough green snake, congo eel salamander, ring-necked snake, six-lined racerunner, corn snake, and biped salamander.

Holbrook must have outlined his zoological studies

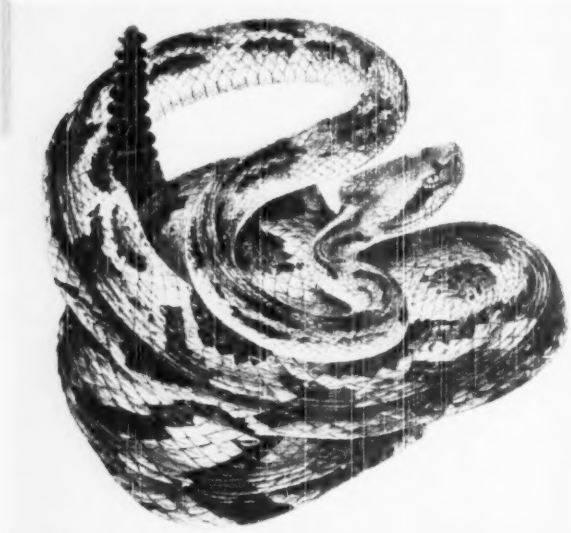
Richard Harlan, the physician-naturalist who first paid tribute to Holbrook's work, named the spadefoot toad for him in 1836, calling it *Scaphiopus holbrookii*. This is from Holbrook's *Herpetology*, courtesy of the Peabody Institute Library, Baltimore.

soon after his settlement in Charleston, and after he had entered upon the duties of his professorship. About this time he married Harriott Pinckney Rutledge, a member of a distinguished family in South Carolina. She was "one of the most talented and gifted women that ever gave happiness to a family or ornamented Society." When in her presence Holbrook was a silent man, with a talent for making others talk. Although he enjoyed society almost as much as did his brilliant wife, he preferred studying the cold-blooded vertebrates at a pretty cottage, known as "Hollow Tree," to attending dinners and receptions.

Colored illustrations were an obsession of Holbrook. He hired J. Sera, an immigrant Italian artist, as early as 1826, to make finely colored drawings from live amphibians and reptiles. Dr. T. L. Ogier, another Charleston physician and colleague, as well as long time friend of Holbrook, remarked that "this excellent artist has a particular fancy for drawing reptiles. We have often heard him say that he could never be satisfied with his work unless he gave the particular expression of his subject. He was enthusiastic about giving the peculiarly hard, cruel expression of the alligator's eye, or the bright, deceitful look of the eye of the blacksnake, as if his subjects belonged to the highest order of creation: and his drawings are indeed facsimiles of the animals he intended to represent and monuments of his talent."

Holbrook labored long on his first draft. The self-imposed task grew upon him, so much so that he remarked: "In undertaking the present work, I was not fully aware of the many difficulties attending it. . . With an immense mass of materials, without libraries to refer to, and only defective museums for comparison, I have constantly been in fear of describing animals as new that have long been known to European naturalists. In no department of American zoology is there so much confusion as in herpetology." He patiently plodded on where others would have given up. During this period he had an immense foreign correspondence and received innumerable letters of introduction from Europe and the North.

Humor attended his avocation despite the gravity of the work. While dissecting the digestive tract of a young alligator for his anatomical supplement to the text of *North American Herpetology*, Holbrook called a young servant who was liable to fainting fits. While brushing flies from the table, the boy would often exclaim, "I'm going to faint," and would, if not assisted, fall into a swoon. This time Holbrook directed the boy to hold the parts for him, so as to keep the fibers stretched. Just as the doctor was most interested in tracing some minute muscular fibers, the boy cried out, "I'm going to faint," and altered the position of the hand, interrupting the dissection at an important point. The doctor immediately gave him a sharp slap on the side of the face, saying, "Well, go faint then, and come back quickly." The boy did as he was bid. He never fainted after this, saying

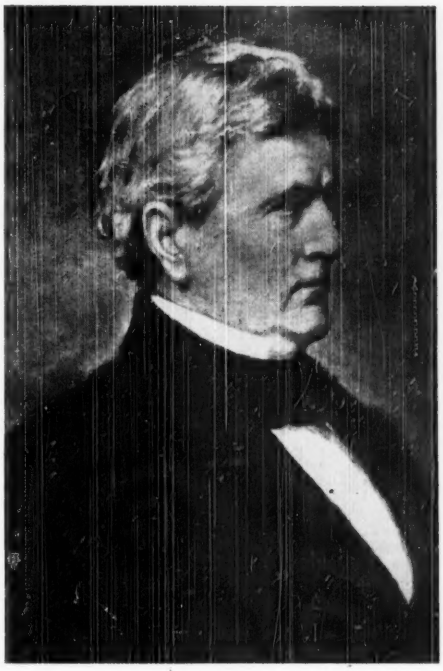


Holbrook's favorite artist, J. Sera, an immigrant Italian, "could never be satisfied with his work unless he gave the particular expression of his subject." Here he has given the timber rattlesnake a particularly hard and cruel expression. Original in color in Holbrook's *Herpetology*, courtesy of Peabody Institute Library.

he was "cured by holding the alligator."

When Holbrook finally published his books, which he distributed by subscription, he issued a volume every year (1836-38) for three years, but the subjects were irregularly presented. An event comparable to finding *The Bay Psalm Book* in some dusty bookshop occurred when several present-day herpetobibliophiles unearthed a fourth volume of the first edition. Only nine copies are known to exist today.

Holbrook apparently was a perfectionist. Theodore Gill, distinguished Smithsonian Institution naturalist, asserted on the authority of the artist, J. Richard: "He would become dissatisfied with a work before its completion and would have new plates drawn and published. Then he would offer to substitute the new for the old numbers, and, I was told, might even decline to let an old subscriber have copy of the new edition unless the old one was returned to be destroyed." Mr. Karl P. Schmidt, chief curator of zoology at the Chicago Natural History Museum, has corrected the impression that Holbrook himself burned the returned copies in a Philadelphia backyard.



COURTE Y N. Y. ZOOLOGICAL SOCIETY

Holbrook as he appeared ten years before the War between the States. He had become internationally eminent and was accorded the honor by the *Jardin des Plantes* in Paris of being allowed to overhaul its collection of reptiles.

The rare fourth volume off his hands, Holbrook ceased publication for several years, accumulated all the material he could, and put them in the current systematic order employed by Dumeril and Bibron. Into this framework he introduced all the species inhabiting the United States, East and West, that he could obtain.

Holbrook made the first real attempt to explode the snake superstitions that arose among uneducated southern whites and Negroes. He remarked: "As to the fascinating or charming power of the timber rattlesnake, I have every reason to believe it a fable; a modification of that of the basilisk of the ancients, a creature whose deadly glance would alone prove fatal."

He corrected another rattlesnake fallacy: "It is commonly supposed that the number of rattles mark the age of the animals, a new one being added annually to those already existing. It is now certain that rattlesnakes have been known to gain more than one rattle a year, and to lose in proportion; the exact number being regulated no doubt by the state of the animal as to health, nourishment, liberty, etc." His revelations, more than 100 years old, have had no effect on American folklore. Any mountaineer will tell you that the age of a rattler with 13 buttons is 13 years.

Holbrook's ability to compose vivid, almost poetic descriptions is probably unsurpassed among ophiologists. Of the diamond-back rattlesnake, the largest venomous snake in North America, he stated, ". . . a more disgusting and terrific animal cannot be imagined than this; its dusky colour, bloated body, and sinister eyes of sparkling grey and yellow, which . . . combine to form an expression of sullen ferocity unsurpassed in the brute creation."

The water moccasin has become the traditional scourge of the South, and he gives a somewhat over-exaggerated account of it: "They are the terror of the negores [sic] that labour about rice plantations, where it is more dreaded than the rattle-snake, which only bites when irritated or in self-defense, or to secure its prey; the water moccasin, on the contrary, attacks everything that comes within reach, erecting its head and opening its mouth for some seconds before it strikes. I have placed in a cage with the water moccasin several of the harmless snakes, as the [corn snake, king snake], etc., . . . they all evinced the greatest distress, hanging to the sides of the cage and endeavoring by every means to escape from their enemy, who attacked them all in turn."

As a connoisseur of zoological art at that time, Holbrook had no peer. He sharply criticised Mark Catesby for the incorrect coloring of a coral snake in the finely-illustrated *Natural History of the Carolinas*. On the other hand he flattered the work of John Audubon, his ornithological friend.

He was often hypercritical of certain predecessors. He accused the wealthy, 18th century Dutch naturalist, Seba, of being notoriously incorrect in the geography of his animals. When Dumeril and Bibron accused William Bartram, an early American naturalist, of writing about a fictitious animal, he lashed out at them, crying that Bartram "was an honest, upright, though somewhat over credulous naturalist."

Several European herpetologists observed that striped skinks were identical with red-headed forms in their studies in Japan. Since Holbrook was also familiar with red-headed and striped, blue-tailed lizards found

around Charleston, closely related animals to the Japanese forms, he stated their observations were incorrect. Subsequent investigations on skink development proved him wrong. He scored, however, when he pointed out that our five-lined skink was not identical with the Japanese skink, despite superficial resemblances. Curiously enough, he did not know the difference between the land and aquatic stages of the newt. He recognized two different species in the small, terrestrial red eft or ebbet.

At last, in 1842, he had brought his work to such a form as was satisfactory enough to himself for publication. He issued in complete form what was in fact an entirely new, five-volume edition entitled *North American Herpetology; Or, A Description of the Reptiles Inhabiting the United States.* This work thus embraced descriptions and illustrations of 147 nominal species, and few of them have proved to be invalid to this day. Holbrook made known a species that had been overlooked until recent times — the large, black-bellied salamander of the Great Smoky Mountains, rediscovered in 1902. He overlooked many of the mountain-dwelling, lungless salamanders native to the Great Smokies not far from his coastal plain home in Charleston — namely, Allegheny Mountains salamander, white-headed salamander, frosted salamander, red-legged salamander, red-cheeked salamander, and some other forms.

Fortunately for the truth of his claims he terminated his work shortly before the acquisition of Texas and California by the United States, and consequently it represents approximately the fauna of the country then possessed by the nation. Soon there were to be added regions inhabited by more varied reptilian populations, especially among the lizards. His successors were able to classify more than triple the number of species inhabiting the older part of the United States.

Holbrook often made excursions in quest of amphibians and reptiles in the pine woods and swamps surrounding Charleston, where a rich fauna and flora was to be found. He rarely made long expeditions for specimens as did Thomas Say and other pioneer American naturalists, but, rather, invoked the aid of various friends in different sections of the United States. His affiliations among many natural history and medical societies here and abroad helped him acquire many specimens and books.

Because of his great capacity for friendship, Holbrook received assistance in various ways. Friends who lived in the country developed a fondness for sending specimens to him; others, having favorable opportunities of observing the habits of some animals, sent him pages of notes and data. Others made dissections of the different organs of many of the reptiles, and some assisted in illustrating the creatures when Sera's services could not be obtained. Spencer Fullerton Baird, the well-known Smithsonian zoologist, in writing to his brother in 1842, mentioned that Holbrook ". . .is going to cancel the first edition of his herpetology and supply subscribers with a new one. Dr. Hallowell of Phila., Holbrook's right hand man there asked me to write down all I knew of the habits of the reptiles & give to him for Dr. Holbrook. Will you send me what you know?"

When Holbrook visited Europe with his wife about 1842, he was a celebrity to French herpetologists. He was greeted warmly by his old friend Valenciennes and other naturalists in Paris. Now he felt qualified to examine the collection at the Museum. In the vast series of reptiles he found several different specimens grouped under one division and some designated as different varieties, which were only the young of a class before described. He pointed out these mistakes. Then he was invited by the Museum authorities, the chief naturalists of Paris, to overhaul the collection and put *his own* labels on the specimens, which he did. He often spoke of this as one of the greatest compliments paid to his knowledge of reptiles.

The work on herpetology being considered completed, Holbrook settled at home and began to prepare a companion work on fishes. Systematic ichthyology, as generally understood, was then in the condition it was placed by Cuvier in 1829 in the second editon of *Regne Animal.* Holbrook's friend, Dr. D. H. Storer of Massachusetts, had compiled, chiefly from it, a poor *Synopsis of the Fishes of North America.* Dr. J. E. Dekay, a few years previously (1842) had published the finely illustrated part on fishes in the *New York Fauna* series, adopting the same system.

With J. Richard as his artist, he brought out a 32-page booklet in 1847, "number two" of a *Southern Ichthyology; or a Description of the Fishes Inhabiting the Waters of South Carolina, Georgia and Florida.*" "Number one," which was to contain the anatomical portion of the work, was never published.

Later he decided to confine the piscatorial survey to his own state. He issued 10 parts to the *Ichthyology of South Carolina.* Further publication was interrupted by a fire, which destroyed the original drawings, plates and stones in the "Artists' (Continued on page 52)

Window Display

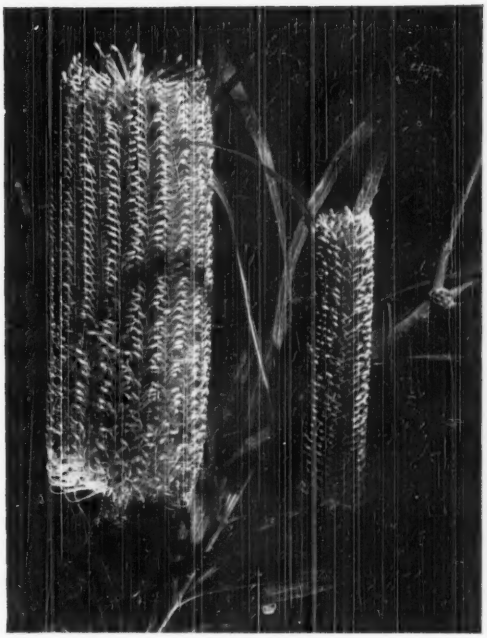
By CLARENCE EDWIN FLYNN

The fur shop window draws attention.
People their admiration mention.
But, though the ladies dearly love it,
The minks are not in favor of it.

Such gorgeous coats, such fine fur pieces!
Enthusiasm never ceases.
Though people like this swank condition,
The otters vote in opposition.

To this and that are buyers beckoned.
Bank balances are quickly reckoned.
Furs neatly packed in ornate boxes
Don't do much for the silver foxes.

Models across the boards are slinking.
Admiring purchasers are thinking.
The "ohs" and "ahs" fill every minute,
But the seals are not joining in it.



Interesting flowers of *Banksia*, two plant immigrants from Australia. Each forms curious, cylindrical terminal spikes. In the variety *speciosa*, at the left, the flower spike is green; in the variety *integrifolia*, at the right, it is yellow.

Plants From "Down Under"

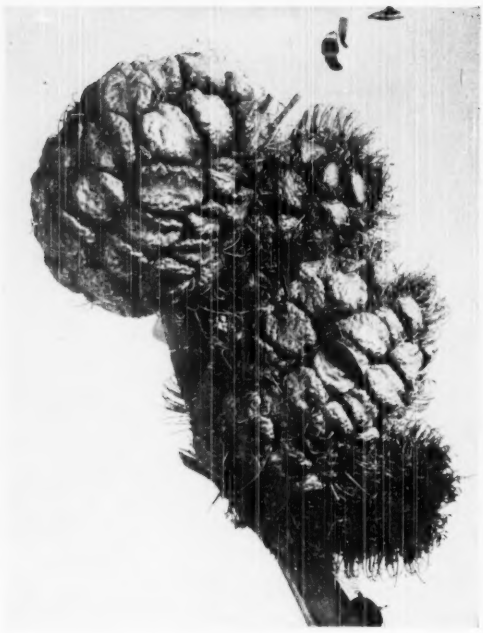
By L. O. HUGGINS

Just as people of the nations of the earth have come to America to live together, many plants have likewise come from far corners of the globe to flourish here, in their new home. This is especially so in southern California, where the exotics, by their weight of numbers alone, have changed the face of the land within the past hundred years. The mountains, it is true, have maintained their age-old growth of chaparral, but the coastal valleys, which were in the past sparsely covered with live oak, sycamore, and desert growth, have now taken on the "New Look," and are clothed with *Citrus*, *Acacia*, *Eucalyptus*, *Pittosporum*, Peppers, Palms, and others too numberous to mention.

An especially interesting little group of these foreigners now living in southern California, is represented by the three genera — *Banksia*, *Hakea*, and *Melaleuca* — all of which are evergreen shrubs or small trees, and all claim far-off Australia as their homeland. These three groups are characterized by decorative plant forms, and strange flowers, with petals either inconspicuous, or entirely lacking. These plants have developed the technique of defense to a high degree; defense against animal, insect, man, and the weather. Hard cases protect the seed from all adversities, until just the right moment for its release. Flowers and leathery foliage present a minimum of surface to drying winds and burning sun. Leaves are usually needle-like, or armed with sharp points, making a hedge that is practically impenetrable to animals or man.

These unfriendly characteristics are offset, however, by the strange beauty of flowers, fruit, and leaves, all of which seem to have an unsurpassed flair for design. In the case of the genus *Banksia*, the flower is a curious, cylindrical terminal spike, green in the variety *speciosa*, and yellow in *integrifolia*. In the "bud" stage the stamens and pistils are encased together in a small stem, which looks like a tiny golf club. It would take an accomplished botanist to find the petals, if there are any. As the buds mature, the stems split open, revealing the stamens and pistils. The latter now form symmetrical patterns on the surface of the spike, while the stamens make another arrangement a fraction of an inch below. In the flower stage, the yellow spikes of the variety *integrifolia* present the ludicrous appearance of corn cobs stuck upright on the branch.

After fertilization, the seed pods grow outward from



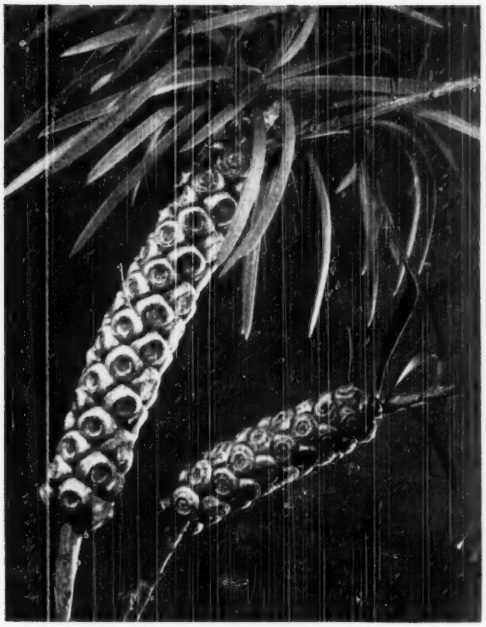
After fertilization, the seed pods of *Banksia integrifolia* grow outward from the center of the spike, gradually engulfing the old stamens and pistils, as above, left and right. Finally the seed case opens into what look like little puckered mouths, as shown in the picture below.

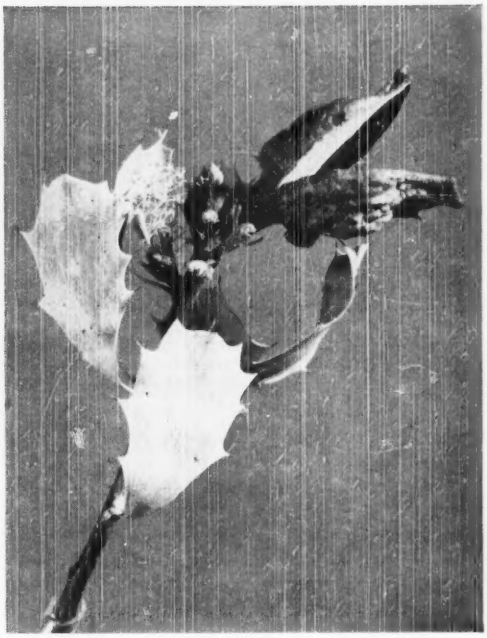
the center of the spike, until they gradually engulf the old stamens and pistils. When ripe, the seed case opens up for all the world like a puckering mouth.

A most curious feature of the variety *speciosa* is the asymmetrical character of the leaves, the two sides of which seem to go on their own sweet way, independent of what occurs on the opposite side of the central vein. This feature is clearly shown in the illustration, where it will be seen that some of the individual "leaflets" are directly opposite each other, while others are opposed to the cleft between the other pair. This reminds one of the drawings of a doodler on a telephone pad.

Another is the odd genus *Hakea*. The variety *suaveolens* resembles a small pine tree, and has foliage that is needle-like, and just as sharp. Its white flowers, although small, are pleasingly fragrant. The seed cases are woody and hard, in the center of which lie two seeds. These have black wings as thin as those of a dragonfly. These capsules open only under suitable climatic conditions to release the seeds, and then can be seen the neat little niche in each woody half, where they have grown. The opened, nut-like seed cases resemble the beak of a bird, as in *Hakea cristata*.

A number of species of *Hakea* are successfully grown in California. These are drought-resistant and can stand a moderate amount of frost. They are adapted for drier parts of the South and the Southwest, and, in California, can be grown as far north as Sacramento. While it is possible to grow these evergreen shrubs from cuttings, they are more usually grown from seeds, which are sown in winter or early spring in soil that is a



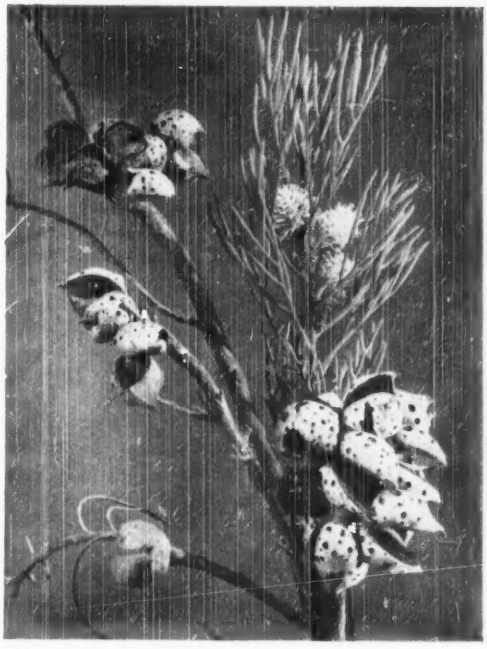


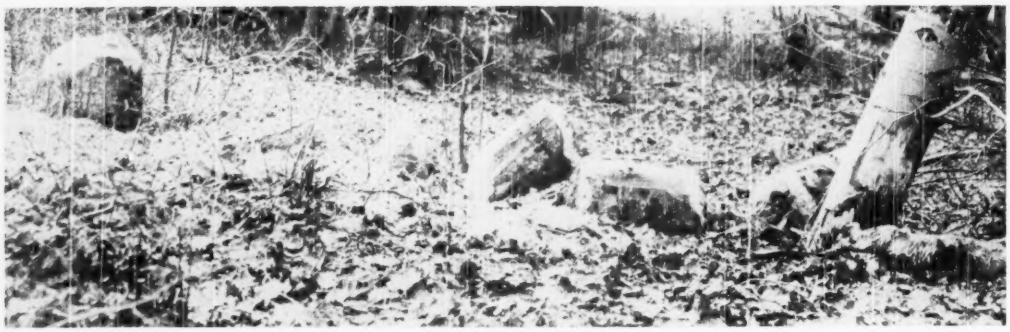
mixture of sand, leaf-mold and loam. They do best in light, well-drained soil.

Genus *Melaleuca* exhibits one of the most nearly unique features of all — the strange, decorative clustering of the seed pods, together with the fact that they persist on the plant indefinitely. In the flowering season, the branch tip assumes the appearance of a bottle brush, the bristles of which are composed of stamens and pistils, often vividly colored in reds and purples. The seed pods develop into a bundle of wooden beads, symmetrically arranged about the stem, each cup retaining the hollow imprint left by the seed. While the flower is still in bloom, its central stem continues to grow, so that by the time the seeds have set, the growth has continued on beyond, sending out new leaves and branches, on the tip of which, next year, will appear the new crop of flowers, and so on, ad infinitum. This brings about the curious result of clusters of seed pods for each year of growth, arranged around ever increasing diameters of branch as we approach the ground or main trunk, and is especially well shown on stems that have failed to put out lateral branches. I have seen shrubs fifteen feet in height, with sequences of clusters from topmost branch all the way to the ground, each marking a year's growth.

These plants from Australia, like many others from distant parts of the world, have found such congenial conditions in our land that they can put their roots down and thrive. We, in turn, enjoy their strange forms, the decoration and design of their various parts. From them, we also gain a greater appreciation of how Nature goes about her business of caring for her own.

Melaleuca, above left, has strange, decorative clusters of seed pods that persist on the plant. Above is another immigrant, ***Hakea cristata***, whose opened seed case looks like the beak of a bird. ***Hakea suaveolens***, below, looks like a small pine and its seeds have delicate, black wings.





Six successive cuts were made in this cottonwood by a persistent beaver, which was caught by the tree after the sixth cut had failed to free the top from its entanglement. Even though trapped, the beaver continued to gnaw. The doomed animal and its final gnawings can be seen at the right.

Perseverance unto Death

By M. E. BEATTY

DEATH from old age, starvation, or predation is an everyday occurrence in the animal kingdom; in fact it is so commonplace that it seldom has any story value. Occasionally, however, death from an unusual cause leaves a train of evidence that reveals a story capable of arousing both human interest and sympathy. Such is the case in the recent discovery of a dead beaver by park rangers on the shore of Lake McDonald, largest lake in Glacier National Park.

The beaver is credited as leading all the mammals of the world in mechanical and engineering skill; also in habits of industry. Visitors in the park always enjoy seeing the evidence of beaver activity, although only rarely do they have an opportunity to see them actually at work because of the animals' usual nocturnal habits. A beaver's food consists of bark from such trees as willow, birch, aspen and cottonwood, and it is not uncommon for beavers to fell a tree more than a foot in diameter in order to get at its branches. The beavers of Glacier National Park apparently are not afraid to tackle even larger trees, for any number of cottonwood stumps may be found that measure close to four feet in diameter.

In felling a tree, beavers first remove the bark around the tree to a width of about a foot, standing on their hind legs while they work. Then, with their strong, chisel-like, front teeth, or incisors, they cut out chips, circling the tree while they work until only the center portion of the trunk remains and the tree falls. Some writers claim the beaver can cause the tree to fall in the desired direction, toward the water, but observation proves this to be not always the case. Often the beaver fails to fell the tree after cutting due to its top becoming entangled with the limbs of another nearby tree. Such was the case in one instance; a case that illustrates the remarkable perseverance of the beaver.

The tree of our story was a fourteen-inch black cottonwood, which the beaver was attempting to cut on the shore of Lake McDonald. The tragic story is remarkably clear, as shown in the above photograph.

After completing the original cut the beaver found its efforts to be in vain. The tree, instead of falling, became entangled in the top branches of another nearby tree. The severed trunk jumped off the stump and became pinned to the ground a few feet away and in a slightly leaning position. The beaver, not to be robbed of its food prize, immediately started a new cut, only to be again disappointed in a like manner. One can easily see the determination of this remarkable animal in continuing this seemingly hopeless task, time and time again. Cutting through the trunk five times in succession without attaining success would seemingly be enough to discourage almost anyone, but not this particular beaver. The story, however, comes to an abrupt end following the sixth and last cut.

Possibly on this sixth attempt to fell the tree the beaver was growing tired and weary and failed to move out of the way speedily. In any case, the trunk of the tree, in jumping from the severed stump, caught a hind leg and part of the tail, firmly imprisoning the animal. But even now the beaver did not give up. The bark on the remaining trunk clearly shows the effort of Castor to cut a new section, perhaps to free itself, before death brought an end to its efforts. Whether death was the result of starvation or of internal injuries is not definitely known as the carcass was in a decayed condition when found. However it is logical to assume that the injury was the contributing factor inasmuch as edible bark still appeared to be within reach.

It would have been interesting to learn how many cuts the beaver would have continued to make in order eventually to fell the tree had it not been injured. Certainly one must admire the persistence of this remarkable animal, which, truly, persevered unto death.

Some Common Woods

By E. LAURENCE PALMER

This is the fifty-fourth in NATURE MAGAZINE'S *series of educational inserts.*

THERE are probably few things in Nature that are so useful to so many of us from birth to death as wood. There are also few things in Nature about which so many persons have so little intelligent appreciation. We graduate from wooden crib to wooden playpen. We progress from playing with wooden toys to playing with wooden baseball bats and reading from wooden books and papers, some of us in wood-heated wooden houses. We may come to a final resting place in a wooden casket. Yet most of us, as a matter of fact, take wood as it comes and pay little attention to it. Whether or not wood figures in our after life is of course a matter of opinion. We get really worked up about food problems, overlooking the fact that the average civilized citizen each year uses up more than three times as much wood as he does food.

Many of our educators help to teach us to think sloppily in generalizations about most subjects, and wood is no exception. One wily industrialist sought public favor by pointing out that for every tree he cut down he planted at least 10 others, but avoided mentioning the number of years it took the big tree to develop, and the period that must pass before the little trees would be more than an economic liability. Our world historians tell us of the ways in which wood-producing areas are managed and mismanaged, and of the effect of such practices on the general economy. And with all of this, relatively few persons can recognize more than a few of the common woods.

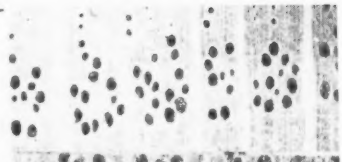
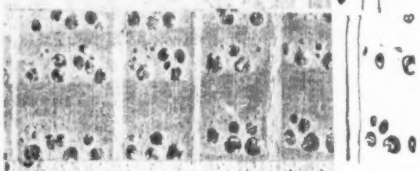
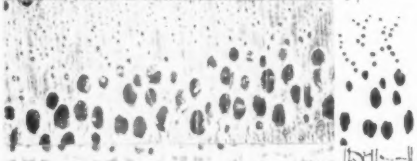
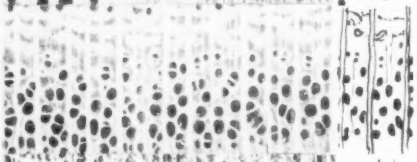
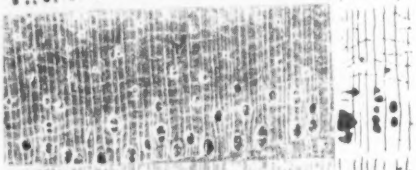
Our poets sing of the beauties of trees, individually and collectively. We and they sing of the "murmuring pines and the hemlocks," and while many can tell a pine tree from a hemlock, fewer can tell pine lumber from hemlock lumber. One teacher once told me of the progress she had made in knowing her trees by saying that at one time Christmas trees were all "Christmas trees," but now they were "evergreens." Old practical lumbermen learn to recognize differences in lumber and say that they know what a wood is by the "feel of it," even though they cannot tell you just what characteristics are of definitive value.

In this insert, we hope to suggest a few specific ways in which you can recognize some of the more common woods produced in the United States. There may be academic merit in gaining this knowledge, and there may be many other values that will accrue. A furniture man may sell an unsuspecting buyer a walnut table, or a quartered oak book case, or a cedar chest. The buyer may not recognize that there is much practical difference between black walnut, or white walnut, or butternut. The buyer may not be able to recognize that in the quartered book case only a few boards are really quartered, and that there is a vast difference between a chest made of white cedar and one made of red cedar. In more ways than one, it is worthwhile to know your woods.

Of course, you may, if you wish, follow the technique of the practical lumberman and spend years handling lumber until you somehow "get the feel" of the different kinds. There are, however, a few short cuts and some of them should be obvious to you soon.

Since wood is a thing of three dimensions — that is, usually the part of a cylinder — it may be well early to learn to recognize how the appearance of wood varies with how we look at it. Let us suppose, for example, that we had cut down a tree. The top of the stump, or the base of the log, would expose a *cross section* or a *transverse section* of the trunk. In most of our species, this would be characterized by a series of concentric, or *annual rings*, which, we are told, serve as records of annual increases in size. It is not our purpose here to argue the merit of this claim, other than to suggest that it is not always exactly correct. However, it will serve our purposes here, and the characters of any piece of wood discussed should offer the easiest basis of making a determination. For this reason, the pictures shown on the succeeding pages are wholly of cross sections of wood. Some of the notes refer to other parts of the wood in cases where a character may be more conspicuous than it may be in the cross section.

If we started splitting the log squarely through the center, we would expose a face that is spoken of as the radial face or radial section. In some logs, before you do this splitting, you may find that there are conspicuous structures that extend like radii from the center of the log towards the outer bar. These *rays*, as they are called, vary greatly in size. Some of those that may be seen only with the greatest difficulty, if at all, in the cross section, show up rather remarkably in the radial section. A hard maple broom handle, for example, will show these rays as rather bright flecks that would be practically invisible in any other section. Since these ray flecks provide us with distinguishing characters in many woods we have to learn how to recognize a *radial section*. The simplest way to do this is merely to remember that it will be the longitudinal face that runs at right angles to the annual rings, which are usually easily observed in any cross section. At right angles to this of course, is another longitudinal face, which we speak of as the *tangential* section. Most commonly, sawed boards expose the tangential face to our view. It is expensive to cut boards so that the exposed face is a radial face, and (Continued on page 32)

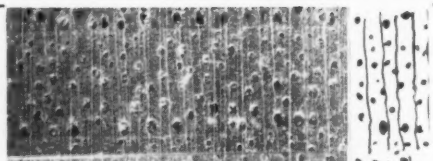
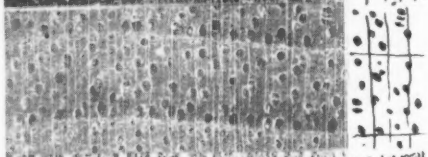
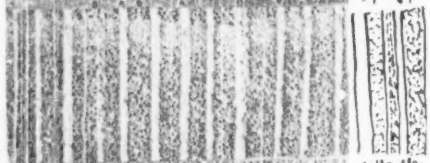
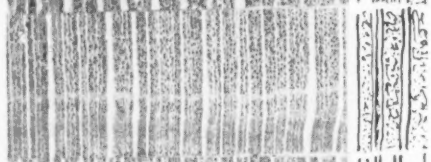
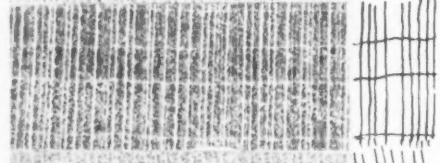
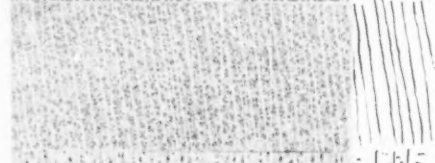
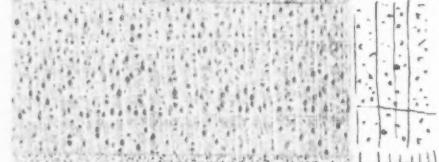
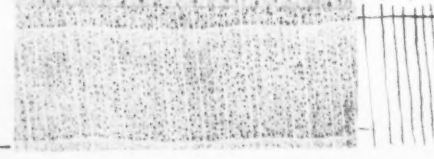
Ring-porous Woods **Red Oak** *Quercus borealis*		*Springwood pores*, large, in rows several pores wide, *open*, usually distinct from summerwood. *Summerwood pores*, small, in radial bands or lines, distinctly visible under lens.	*Annual ring*, uniform, wide, distinct. *Rays*, the large distinct in any section, the small, only with lens. *Sapwood* of variable width, grayish to pale red. *Heartwood*, light to dark brown.
White Oak *Quercus alba*		*Springwood pores*, large, in rows several pores wide, apparently *filled*, easily seen in any section. *Summerwood pores* too small to be seen individually and too numerous to count.	*Annual ring* distinct. *Rays* conspicuous in all sections but finer not seen without lens help. *Sapwood* of variable width, gray-white to pale brown.
Chestnut *Castanea dentata*		*Springwood pores*, large, in several rows, easily seen with naked eye in any section. *Summerwood pores*, small, arranged in wavy, *branching* radial lines or groups of lines.	*Annual ring*, distinct. Rays, fine, not distinguishable even with help of hand lens ordinarily. *Sapwood*, narrow, white to light brown. *Heartwood*, gray to brown, darkening with age.
Honey Locust *Gleditsia triacanthos*		*Springwood pores*, large, making ring about $\frac{1}{2}$ width of annual ring. *Summerwood pores*, small openings not clearly distinguishable without aid of lens.	*Annual ring*, distinct, irregular in width. *Rays*, distinct without aid of lens. *Sapwood*, $\frac{3}{4}$ to 2 inches wide, yellow. *Heartwood*, bright cherry red to reddish brown.
Black Locust *Robinia pseudoacacia*		*Springwood pores*, relatively large, apparently plugged, and in a row two or three pores thick, not too defined. *Summerwood pores*, in wavy, rather continuous and coarse lines.	*Annual ring*, distinct, of variable width. *Rays* barely visible with hand lens in cross section. *Sapwood*, narrow, yellowish, under $\frac{1}{2}$ inch wide. *Heartwood*, brown, red or green.
American Elm *Ulmus americana*		*Springwood pores*, large and usually in one row, the number of rows varying with the species. *Summerwood pores*, small and in waving concentric lines parallel to annual rings.	*Annual ring*, distinct. *Rays* inconspicuous to naked eye in any section but may show in filled wood. *Sapwood*, wide, gray-white to light brown. *Heartwood*, light to reddish-brown.
Hackberry *Celtis occidentalis*		*Springwood pores*, large making rings 2-5 pores wide. *Summerwood pores*, small, numerous, in continuous tangential wavy rings. *Heartwood*, large pores partly closed, green-yellow.	*Annual rings*, distinct. *Rays*, distinctly visible to the naked eye. *Sapwood*, wider than in elm, pale yellow to gray or greenish yellow, discolored.
Shagbark Hickory *Carya ovata*		*Springwood pores*, large, easily visible to naked eye in any section, relatively few. *Summerwood pores*, few not visible to naked eye but with lens many light lines parallel rings.	*Annual rings*, distinct but not conspicuous. *Rays* not ordinarily visible to naked eye at any angle. *Sapwood*, of variable width, white, uniform. *Heartwood*, pale to red-brown.
White Ash *Fraxinus americana*		*Springwood pores*, large and in bands of several pores wide, rather well defined. *Summerwood pores*, small, few, scattered, *not* in wavy lines parallel to annual rings as in elm.	*Annual ring*, distinct, wide. *Rays*, just visible with naked eye, not apparent in finished wood at any angle. *Sapwood*, wide and nearly a clear white. *Heartwood*, pale yellow to brown.
Red Mulberry *Morus rubra*		*Springwood pores*, relatively large, apparently plugged and commonly glisten, ring 2-8 pores wide. *Summerwood pores*, in wavy, tangential lines in *outer* part of ring, only visible.	*Annual ring*, distinct but not conspicuous. *Rays*, distinct, even without aid of hand lens. *Sapwood*, less than $\frac{1}{2}$ inch through, white to yellow. *Heartwood*, yellow to strong orange-brown.

36 to 45 lbs. per cu. ft. 12% H_2O, 63 lbs. per cu. ft. *Specific gravity*, 0.56. Hard, comp. figure, 103. No odor, tough, hard, open texture, straight grained, splintery under some circumstances.	*Strength*, shock figure, 143. Bending figure, 99. Compression figure, 88. Stiffness figure, 164. *Shrinkage*, Radial shrinkage, 4%. Tangential, 8.2%. Volumetric figure, 131.	Not durable where decay is possible or easy. Splits, warps and shrinks easily in curing and to considerable extent. 1 cord at 20% moisture weighs 5020 lbs.	Splits when nailed. Holds nails well. Holds paint well after filling, machines very satisfactorily. Fuel value (66.04) inferior to white oak. 1 cord equals 1 ton of coal. At 200° C. ignites in 13.3 seconds.	Used in making caskets, cabinets, furniture, boxes, boats, doors, flooring, fixtures, railroad ties, interior woodwork, piling, tools and tool handles and in heavy construction work.
36 to 50 lbs. per cu. ft. 12% H_2O, 63 lbs. per cu. ft. *Specific gravity*, 0.59. Hard, comp. figure, 109. Little or no odor, stiff, coarse, tough, bends well when steamed and then holds shape well.	*Strength*, shock figure, 125. Bending figure, 99. Compression figure, 93. Stiffness figure, 149. *Shrinkage*, Radial shrinkage, 5.3%. Tangential, 9.3%. Volumetric figure, 155.	Succumbs easily to decay, but durable when dry. May warp and bend but can be controlled in curing. Splits easily in curing. 1 cord at 20% moisture weighs 5040 pounds.	Splits when nailed. Holds nails well. Tough. Finishes well with filler. Polishes well. Superior fuel value (74.39) burning well and gives good cooking coals. 1 cord equals 1 ton of coal in heat values.	Used in making floors, doors, furniture, posts, railroad ties, in ship building, in mine timbers, in cabinet work in interior finish and in making of tools and tool handles.
30 lbs. per cu. ft. 12% H_2O, 55 lbs. per cu. ft. *Specific gravity*, 0.40. Moderately hard, figure (50). Slight taste, stiff, brittle, coarse grained, open grained, may splinter if thoroughly dried.	*Strength*, shock figure, 69. Bending figure, 68. Compression figure, 70. Stiffness figure, 112. *Shrinkage*, Radial shrinkage, 3.4%. Tangential, 6.7%. Volumetric figure, 111.	Highly resistant to decay. Splits easily and cures well with little change in size or shape and so is ideal for woodwork subject to varying dampness in different seasons.	Splits in nailing. Glues well. Takes paint and finishes well but should have filler. May split in sawing. Fuel value (44.95) making excellent firewood and superior fuel for camp cooking because of good coals.	Used in heavy construction, in posts, poles, for interior finish, in furniture and cabinet work, in caskets. Tannin is extracted with hot water. Supply limited because of destruction of trees by blight.
Very heavy. 12% H_2O, 44 lbs. per cu. ft. *Specific gravity*, 0.61. Hardness, 155. Average freedom from taste and odor, with average freedom from knots.	*Strength*, shock figure, 144. Bending figure, 112. Compression figure, 111. Stiffness figure. 153. *Shrinkage*, Radial shrinkage, 4.2%. Tangential, 6.6%. Volumetric figure, 107.	With average durability when exposed to causes of decay. With average freedom from shrinkage and warping during seasoning process, shrinking little.	Works well with tools. Glues poorly. Holds nails well but splits badly during the nailing process.	Much like Kentucky coffee tree but latter has narrow sapwood, larger pores in outer summerwood and less distinct rays. Used in fence posts, rails, general construction, interior trim, wagon wheels, furniture.
48 lbs. per cu. ft. 12% H_2O, 58 lbs. per cu. ft. *Specific gravity*, 0.66. Moderately hard, figure, 155. Odorless, stiff, tough, coarse, strong, holds shape well under varying conditions.	*Strength*, shock figure, 161. Bending figure, 170. Compression figure, 168. Stiffness figure, 220. *Shrinkage*, Radial shrinkage, 4.4%. Tangential, 6.9%. Volumetric figure, 103.	Highly resistant to decay and durable when exposed to weather. Splits with difficulty. Shrinks, checks, bends badly in curing.	Hardly suitable except for coarse construction work. Nails with difficulty but holds nails well. Excellent fuel value making good coals. 1 cord is equal to 1 ton of coal as fuel.	Used in telephone poles and cross arms, in posts, in making wooden pins and nails, in furniture and as a source of dye which may be extracted by boiling. Dye is relatively permanent.
36 lbs. per cu. ft. 12% H_2O, 54 lbs. per cu. ft. *Specific gravity*, 0.46. Moderately hard, 66. Stiff, coarse, tough, odorless, reasonably straight grained.	*Strength*, shock figure, 123. Bending figure, 85. Compression figure, 74. Stiffness figure, 130. *Shrinkage*, Radial shrinkage, 4.2%. Tangential, 9.5%. Volumetric figure, 145.	Of average durability. Splits with great difficulty. Warps and bends badly during curing and must be turned frequently to avoid bad distortion during the curing process.	Nails with great difficulty but holds nails once they are in. Holds paint well. Saws with difficulty. Fuel value (66.54) makes it a good firewood one cord equalling ¾ ton of coal as fuel.	Used in making boxes, crates, barrels, in tools, in poultry supplies, in some furniture, particularly in rockers, in some cases in boats and boat accessories, bats, skis, cooperage.
Moderately heavy. 12% H_2O, 37 lbs. per cu. ft. *Specific gravity*, 0.49. Hardness, 74. Odorless, tasteless, splinters easily, yellow green.	*Strength*, shock figure, 145. Bending figure, 76. Compression figure, 72. Stiffness figure, 108. *Shrinkage*, Radial shrinkage, 4.8%. Tangential, 8.9%. Volumetric figure, 138.	With average resistance to decay. Relatively free from excessive warping and shrinks only moderately.	Works poorly with small tools. Planes and turns fairly well. Glues well. Has average nail-holding ability but splits in nailing. Has a fuel value about similar to that given for elm.	Better grades are used in furniture and in general millwork. Common in sporting goods, boxes, crates, coarse construction and much the same as elm in general respects. Better grades as good as white ash.
38 to 51 lbs. per cu. ft. 12% H_2O, 64 lbs. per cu. ft. *Specific gravity*, 0.64. Hard, comp. figure, 142. With or without odor, tough, swells when wet, stiff, uniform, coarse, may be bent when steamed.	*Strength*, shock figure, 258. Bending figure, 133. Compression figure, 123. Stiffness figure, 185. *Shrinkage*, Radial shrinkage, 7%. Tangential, 10.5%. Volumetric figure, 170.	Not durable where decay is possible. Shrinks much in curing and may warp and twist and bend but once set holds shape. Splits with great difficulty particularly when cured.	Hard to nail but holds nails well when once set. Holds paints and finish fairly well and takes a good polish and may be smoothed remarkably well. One of best fuels with value of 83.11, hard to cut.	Used in heavy construction work of many kinds, in making tool handles, in machinery, in cooperage, barrels, sporting goods, in barrel hoops, in turnery to some extent.
34 to 42 lbs. per cu. ft. 12% H_2O, 48 lbs. per cu. ft. *Specific gravity*, 0.55. Hard, comp. figure, 107. Odorless, uniform, fine, hard, tough, holding shape well under varying conditions.	*Strength*, shock figure, 153. Bending figure, 113. Compression figure, 106. Stiffness figure, 168. *Shrinkage*, Radial shrinkage, 4.9%. Tangential, 7.9%. Volumetric figure, 132.	Durable when dry but rots quickly in weather. Holds shape well during the curing process and after but may split rather easily. Mashed annual rings peel off making good splints.	Splits easily but holds nails well once they are in. Holds paint well. Takes polish and stains well. Excellent fuel value (65.16) but too valuable for general use. 1 cord equals 0.9 ton of coal.	In furniture, as oars, in boat building, in baseball bats and other sport equipment, in barrels, farm machinery, as poles, spokes, handles and turnery, as splints for use in baskets, chair seats, barrel hoops.
37 lbs. per cu. ft. 12% H_2O, 50 lbs. per cu. ft. *Specific gravity*, 0.59. Soft as compared with most common ring-porous woods. Generally weak and compact.	*Strength*, shock figure, good. Bending figure, fair. Compression figure, fair. Stiffness figure, fair. *Shrinkage*, Shrinks rather badly as contrasted with other related woods.	Durable under ordinary circumstances. Checks badly during the seasoning process and may split when drying early or late in the stage.	While it splits easily when nailed it takes nails easily and holds them rather well once they are in place. A relatively superior fuel with the wood having a value of 58.56 which obviously is not of the best.	Used in cooperage, in ship building, in construction of farm implements, in boxes, baskets, crates, fence posts, interior finish, caskets, wagons, coarse wooden equipment of many kinds.

Non-porous Woods

White Pine *Pinus strobus*	*Springwood* shows gradual transition to summerwood. Resin ducts show white flecks. *Summerwood*, uniform with transition from springwood gradual at all times.	*Annual ring*, well defined, not prominent, shows resin ducts. Rays not visible except with help of lens. *Sapwood*, narrow, medium white to pale yellow. *Heartwood*, yellow to pale brown.
Yellow Pine *Pinus echinata*	*Springwood*. Resin ducts present, large in outer parts. More conspicuous in lodgepole pine. *Summerwood*. Resin ducts present, in distinct band as contrasted with white pine.	*Annual rings*, 20 to 30 per inch. *Rays*, fine and few, with some wider with horizontal resin ducts. *Sapwood*, well defined, $2\frac{1}{2}$ to 4 inches wide, wider than lodgepole.
Larch *Larix laricina*	*Springwood*, obviously lighter than the summerwood. *Summerwood*, forms a conspicuous dark band easily seen by naked eye.	*Annual ring*, moderately wide, a few scattered resin ducts. Rays, fine, seen only good lens. *Sapwood*, under 1 inch lighter than heartwood. *Heartwood*, yellow-brown to russet.
Black Spruce *Picea mariana*	*Springwood*, shows gradual transition to summerwood. Resin ducts, few and well scattered. *Summerwood*, shows gradual transition from springwood.	*Annual ring*, narrow, distinct but not conspicuous. *Rays*, fine, visible only with lens. *Sapwood*, white to brown. *Heartwood* usually indistinct from sapwood.
Hemlock *Tsuga canadensis*	*Springwood*, shows an abrupt change to summerwood. Resin ducts absent. Resin cells, few. *Summerwood*, shows abrupt and conspicuous transition from springwood.	*Annual ring*, wide and distinct. *Rays*, numerous but obscure except under lens. *Sapwood*, thin and darker than heartwood. *Heartwood*, light brown with bad smell.
White Cedar *Thuja occidentalis*	*Springwood*, wider and softer than the summerwood, with no resin ducts or resin cells visible. *Summerwood*, narrower and darker than springwood and resin cells or ducts.	*Annual ring*, distinct but not prominent. *Rays*, fine, inconspicuous even under lens. *Sapwood*, narrower and grayish white. *Heartwood*, straw-brown, lustrous at times.
Balsam Fir *Abies balsamea*	*Springwood*, transition from springwood to summerwood gradual, no resin ducts or resin cells. *Summerwood*, hardly if at all distinguishable from springwood pores ordinarily.	*Annual ring*, wide and relatively indistinct. *Rays*, inconspicuous, not seen without help of good lens. *Sapwood*, thick and generally whitish. *Heartwood*, yellowish to pale brown.
Red Cedar *Juniperus virginiana*	*Springwood*, uniform, only slightly different from summerwood. *Summerwood*, transition to springwood obvious but not conspicuous.	*Annual ring*, distinct but not conspicuous, no resin ducts. *Rays*, fine, not visible except with lens. *Sapwood*, narrow and nearly white. *Heartwood*, rose to purple to red or dark brown.
Cypress *Taxodium distichum*	*Springwood* shows resin cells as abundant, particularly arranged in tangential bands. *Summerwood*, denser in dark conspicuous band.	*Annual ring*, irregular in width and wavy in outline, of contrasting colors. *Sapwood*, usually over 1 inch wide with gradual transition, pale. *Heartwood*, variable in color.
Redwood *Sequoia sempervirens*	*Springwood*, with resin ducts normally absent. Transition abrupt. Narrow to wide. *Summerwood*, darker and denser than springwood and either narrow or broad.	*Annual rings*, moderately regular, distinct. *Rays*, narrow, uniform, light colored, easily seen with lens. *Sapwood*, 1 or more inches wide, almost white. *Heartwood*, reddish-brown.

18 to 25 lbs. per cu. ft. 12% H_2O, 36 lbs. per cu. ft. *Specific gravity*, 0.34. Soft, comparative figure, 35. Odor, slightly resinous, clear, uniform, elastic, easily worked at all times.	*Strength*, shock figure, 55. Bending figure, 63. Compression figure, 67. Stiffness figure, 119. *Shrinkage*, Radial shrinkage, 2.3%. Tangential, 6%. Volumetric figure 83.	High durability and resists decay if kept dry. Splits easily. Shrinks little. Cures relatively easily. 1 cord, 20% moisture, weighs 2880 pounds.	Nails easily usually without splitting. Holds nails fairly well. Takes paint and stains well. Of good kindling value but yields little heat (38.47). Gives much light. 2 cords equals 1 ton of coal.	Excellent for wood trimming, sidings on houses where it weathers remarkably well. Used in medium construction, in pulp manufacture, for interior finish, woodenware, shelving, floors, doors, light furniture.
Weight, 24 lbs. per cu. ft. 12% H_2O, 28 lbs. per cu. ft. *Specific gravity*, 0.38. Hardness, figure, 41. General characters, slightly resinous, taste not objectionable, splinters, straight grained.	*Strength*, shock figure, 58. Bending figure, 65. Compression figure, 69. Stiffness figure, 112. *Shrinkage*, Radial shrinkage, 3.9%. Tangential, 6.3%. Volumetric figure, 97.	Low durability when exposed to conditions favorable to decay. Shrinks and checks but little during the seasoning process. Resists abrasive action well.	Takes screws well without splitting. Has low shock resistance. Glues well and holds paint well. Does not split in nailing and holds nails well.	Used in making boxes, crates, doors, screens, heavy construction, caskets, coffins, posts, veneer and for general timbers.
37 lbs. per cu. ft. 12% H_2O, 47 lbs. per cu. ft. *Specific gravity*, 0.49. Medium hard, figure, 53. Coarse, hard, brittle but strong and heavy.	*Strength*, shock figure, 85. Bending figure, 84. Compression figure, 96. Stiffness figure, 163. *Shrinkage*, Radial shrinkage, 3.7%. Tangential, 7.4%. Volumetric figure, 128.	Durable under all conditions. May warp badly in drying and shows some shrinkage but splits with difficulty particularly when well cured.	May split when being nailed. Holds nails well. Fuel value relatively high, 62.16. Exposed at 200°C. ignites in 14.5 seconds; in 2.3 seconds at 300°C. This is relatively high for a conifer.	Used in making railroad ties, in poles for posts, in telephone poles, ship building, heavy construction timbers particularly where exposure to weather is necessary.
21 to 25 lbs. per cu. ft. 12% H_2O, 32 lbs. per cu. ft. *Specific gravity*, 0.38. Soft, comparative figure, 40. Texture, uniform. Elastic. Holds shape under water. Resonant. Fine-grained.	*Strength*, shock figure, 82. Bending figure, 68. Compression figure, 70. Stiffness figure, 143. *Shrinkage*, Radial shrinkage, 4.1%. Tangential, 7.2%. Volumetric figure, 112.	Not durable where decay is possible. Splits easily. Shrinks moderately in curing and maintains its shape well after seasoning is over.	Nails easily and does not split when nailed. Holds nails poorly but paints well. A poor fuel with heating value of 37.26. Good as kindling. 2 cords of wood equals 1 ton of coal.	Used in making boxes, crates, cooperage, paddles, oars, canoes, woodenware, pulp, light construction work.
28 lbs. per cu. ft. 12% H_2O, 50 lbs. per cu. ft. *Specific gravity*, 0.38. Moderately hard, figure, 51. With unpleasant odor when wet, stiff, brittle, coarse, "brash", splinters badly but easily identified.	*Strength*, shock figure, 67. Bending figure, 72. Compression figure, 79. Stiffness figure, 121. *Shrinkage*, Radial shrinkage, 3%. Tangential, 6.8%. Volumetric figure, 98.	Not durable when exposed to sources of decay. Splits easily. Shrinks somewhat. Warps and checks badly in the curing process. Crooked grain.	Hard to work. Will not take a smooth finish. Nails well. Takes paint well. Glues satisfactorily. Fairly good fuel, with 42.2 value. Used more as kindling than as lasting fire. 1½ cords equals 1 ton of coal.	Used in coarse and in rough coarse and in rough construction work as in houses where exposure to weather is not necessary. Common rafter, lath, joist timbers.
22 lbs. per cu. ft. 12% H_2O, 28 lbs. per cu. ft. *Specific gravity*, 0.29. Soft, comparative figure, 30. Odor, like cedar leaves, with bitter taste, fine texture, smooth, brittle and uniform.	*Strength*, shock figure, 47. Bending figure, 50. Compression figure, 52. Stiffness figure, 78. *Shrinkage*, Radial shrinkage, 2.1%. Tangential, 4.7%. Volumetric figure, 69.	Highly resistant to decay under a variety of conditions. Shrinks little in curing and holds shape well when cured. Splits easily when being worked.	Takes nails easily and without splitting and holds both nails and paint well. Works well generally. A poor fuel with heat production 31.53. Good as tinder, and kindling. 2 cords equals 1 ton of coal.	Used in making fence posts, poles, railroad ties, pails, wooden-ware, carved objects, canoes, paddles, row boats, shingles, wood turnery, cooperage and for many other things.
26 lbs. per cu. ft. 12% H_2O, 45 lbs. per cu. ft. *Specific gravity*, 0.34. Soft, comparative figure, 31. Without much if any odor. Little strength or hardness. Splintery but generally uniform.	*Strength*, shock figure, 50. Bending figure, 59. Compression figure, 67. Stiffness figure, 118. *Shrinkage*, Radial shrinkage, 2.8%. Tangential, 6.6%. Volumetric figure, 103.	Not durable particularly when in contact with the soil or exposed in weathering. Shrinks moderately and warps readily and badly in seasoning. Splits easily.	Works easily. Nails easily. Takes and loses paint readily. Does not take a permanent or smooth finish. Of low fuel value, 38.02 and sometimes does not hold fire well so of little value as a campfire wood.	Used in making packing cases, boxes, crates, sheathing, in pulp and often mixed with spruce and pine by unscrupulous or careless dealers as a cheap substitute. Tree, one of the best of Christmas trees.
33 lbs. per cu. ft. 12% H_2O, 37 lbs. per cu. ft. *Specific gravity*, 0.44. Hard, comparative figure, 81. Odor, distinct, strong and pleasing. Takes high polish. Brittle. Uniform. Color pattern attractive.	*Strength*, shock figure, 114. Bending figure, 67. Compression figure, 87. Stiffness figure, 80. *Shrinkage*, Radial shrinkage, 3.1%. Tangential, 4.7%. Volumetric figure, 78.	Resistant to decay in almost any form. Shrinks little in curing. Splits only with considerable difficulty. Can withstand weathering remarkably well.	Holds and takes nails well. Takes a good smooth finish. Cuts evenly and smoothly. Takes stain and glue. Good fuel, with heat value of 49.11. Excellent as tinder particularly in shavings.	Used in fence posts, cedar chests, clothes closets, pencils, poles, caskets, trinkets, wood turnery, toys and a great variety of other things. Shavings used in clothes closets.
26 lbs. per cu. ft. 12% H_2O, 32 lbs. per cu. ft. *Specific gravity*, 0.42. Hardness, 52. With a greasy feel and a slightly rancid odor, tasteless, greasiness does not affect contacted objects.	*Strength*, shock figure, 75. Bending figure, 79. Compression figure, 92. Stiffness figure, 136. *Shrinkage*, Radial shrinkage, 3.8%. Tangential, 6.2%. Volumetric figure, 104.	Highly durable and reported to be resistant to termite attack. Splits easily and is difficult to kiln dry because it shrinks considerably and may collapse if not properly handled.	Low in shock resistance, rather difficult to work with tools. Holds paint well and glues satisfactorily. Has a fuel value in which 2 cords are equivalent to one ton of coal in heat production	Used in sashes, blinds, and in construction commonly exposed to weather. Used in caskets, coffins, millwork, refrigerators, boxes, crates, general cooperage, posts, poles, ships and as an interior trim.
Light to moderately light. 12% H_2O, 30 lbs. per cu. ft. *Specific gravity*, 0.41. Odorless, tasteless, straight grained or rarely wavy or in burls beautifully distorted.	*Strength*, shock figure, 70. Bending figure, 90. Compression figure, 104. Stiffness figure, 134. *Shrinkage*, Radial shrinkage, 2.7%. Tangential, 4.2%. Volumetric figure, 65.	Very durable when exposed to causes of decay, reportedly highly resistant to termite attack and to fire. Splits easily, warps little and shrinks little.	Works moderately well with tools. Holds paint well. Holds glue well. Takes and holds nails well with little splitting. Ignites in 28.5 seconds at 180°C. 2 cords equals 1 ton of coal in fuel value.	Used in shingles, general construction, fence posts, tanks, vats, siding, cigar boxes, crates, boats, garden furniture. Shredded bark used as insulation. Burls used in fancy furniture and woodwork.

Diffuse-porous Woods BLACK WALNUT *Juglans nigra*		*Springwood pores*, plainly visible to naked eye and somewhat larger than those of the summerwood. *Summerwood pores*, plainly visible, decrease in size towards outer areas.	*Annual ring*, may appear obscurely ring porous but ring distinct. *Rays* indistinct at all angles. *Sapwood*, narrow, white to yellowish brown. *Heartwood*, chocolate to dk. brn.
BUTTERNUT *Juglans cinerea*		*Springwood pores*, plainly visible to naked eye, grade gradually to size of summerwood pores. *Summerwood pores*, decrease in size outward and may appear in radial section.	*Annual ring*, distinct, usually wide. *Rays*, fine, inconspicuous without help of lens. *Sapwood*, narrow, white to light brown. *Heartwood*, light brown to chestnut, often reddish.
SYCAMORE *Platanus occidentalis*		*Springwood pores*, not visible to the naked eye, not conspicuously different from summerwood color. *Summerwood pores*, numerous, often crowded, no darker band.	*Annual ring*, distinct but not conspicuous or defined. *Rays*, of 2 kinds, obvious, larger always conspicuous. *Sapwood*, 1 to 3 inches. *Heartwood*, white to red-brown.
BEECH *Fagus grandifolia*		*Springwood pores*, microscopic, seen only with hand lens and then appear to be crowded somewhat. *Summerwood pores*, darker than in springwood and few in darker band.	*Annual ring*, distinct, well defined, uneven, inconspicuous. *Rays*, of 2 kinds, broader easily seen. *Sapwood*, 2 to 5 inches wide, whitish. *Heartwood*, white to reddish or brown.
SUGAR MAPLE *Acer saccharum*		*Springwood pores*, small, indistinct, hardly visible to naked eye, evenly distributed into summerwood. *Summerwood pores* similar. Pithrays rarely appear.	*Annual ring*, distinct, inconspicuous, defined by dark red-brown lines. *Rays*, just visible. *Sapwood*, variable width, white to red. *Heartwood*, of no definite color, often curly.
RED MAPLE *Acer rubrum*		*Springwood pores*, not visible to naked eye and evenly distributed through springwood and summerwood. *Summerwood pores*, as described for springwood; solitary.	*Annual ring*, defined by dark brown. *Rays*, distinct but hardly visible to naked eye except in radial section. *Sapwood*, wide, lighter in color than heartwood. *Heartwood*, red-brown.
TULIP TREE *Liriodendron tulipifera*		*Springwood pores*, seen only with help of hand lens and then appear to be evenly distributed. *Summerwood pores*, as described for the springwood and hardly distinguishable.	*Annual ring*, distinctly marked by plain fine light line. *Rays*, minute, evenly spaced and seen with naked eye. *Sapwood*, narrow and whitish. *Heartwood*, light yellow to dark green.
BLACK CHERRY *Prunus serotina*		*Springwood pores*, evenly distributed and neither plain nor visible to the unaided eye. *Summerwood pores*, essentially the same as the pores of the springwood.	*Annual ring*, distinct, not conspicuous or defined. *Rays*, plainly visible to naked eye though small. *Sapwood*, narrow and white to light brown. *Heartwood*, light to dark brown.
YELLOW BIRCH *Betula lutea*		*Springwood pores*, appear as whitish dots not crowded and barely visible to naked eye undtr ideal conditions. *Summerwood pores*, not distinct but evenly distributed.	*Annual ring*, indistinct without lens. Rays fine, not distinct without help of good lens, narrower than pores. *Sapwood*, narrow to wide, whitish to light red brown. *Heartwood*, brown.
BASSWOOD *Tilia americana*		*Springwood pores* small and indistinct when seen even with help of hand lens. Uniform. *Summerwood pores*, small and indistinct even with lens, may appear indistinctly lacelike.	*Annual ring*, distinct but not prominent. Rays, evenly spaced, straight, indistinct. *Sapwood*, wide, creamy white to pale brown to darker. *Heartwood*, darker and uniform.

39 lbs. per cu. ft. 12% H_2O, 58 lbs. per cu. ft. *Specific gravity*, 0.51. Hard, comparative figure, 88. With mild odor that may be distinct. Texture, uniform. Tough, not splintery. Generally beautiful.	*Strength*, shock figure, 124. Bending figure, 111. Compression figure, 113. Stiffness figure, 167. *Shrinkage*, Radial shrinkage, 5.2%. Tangential, 7.1%. Volumetric figure, 116.	Durable under almost all conditions. Shrinks but little in curing though it may warp and check somewhat. Splits irregularly under some circumstances but does so with difficulty.	Works beautifully carves well, takes stain and polish splendidly, glues well and generally works well. Of high fuel value (60.91) but other uses of greater importance so only trim is suitable for fuel.	Used in stocks for firearms, furniture, sewing machines, posts, veneer, in plywood, for carved ornaments and formerly sometimes for interior decoration and even for flooring or floor tiles.
25 lbs. per cu. ft. *Specific gravity*, 0.36. Relatively soft, 40. Texture, uniform. Weak when compared with close relative black walnut.	*Strength*, shock figure, 80. Bending figure, 64. Compression figure, 68. Stiffness figure, 115. *Shrinkage*, Radial shrinkage, 3.3%. Tangential, 6.1%. Volumetric figure, 100.	Of good durability. May split irregularly in curing or otherwise but shrinks comparatively little when being cured which, of course, contributes to its value in furniture.	Works well. Takes stains, paints and glues well but does not stand heavy use too well. Fuel value of (40.66) obviously less than that of black walnut but at that is too valuable to be used as firewood ordinarily.	Used in furniture, in cabinet work, in cooperage, wood turnery, carved ornaments for interior finish and in veneers. Always inferior to black walnut.
35 lbs. per cu. ft. 12% H_2O, 52 lbs. per cu. ft. *Specific gravity*, 0.46. Moderately hard, (64). Odorless, tough, cross-grained, stiff, hard to work in any way. Rays often conspicuous.	*Strength*, shock figure, 78. Bending figure, 74. Compression figure, 76. Stiffness figure, 129. *Shrinkage*, Radial shrinkage, 5.1%. Tangential, 7.6%. Volumetric figure, 136.	Of average durability. Shrinks considerably, warps badly and checks and splits freely during curing process but hard to split once it is properly cured. May be cut into veneer if treated with care.	Nails with greatest difficulty but holds nails well. Takes stains and glues reasonably well in veneer. Good as fuel but too difficult to split for popularity. 1½ cords as fuel equals 1 ton of coal.	Used in making butchers' blocks, tobacco boxes, furniture, sugar barrels, interior finish, cooperage, millwork, general cabinet work, turnery and for other general purposes where splitting is undesirable.
26 lbs. per cu. ft. 12% H_2O, 41 lbs. per cu. ft. *Specific gravity*, 0.56. Hard, comparative figure, 96. Odorless, tough, hard to work under ordinary circumstances, with great tendency to split.	*Strength*, shock figure, 135. Bending figure, 102. Compression figure, 94. Stiffness figure, 169. *Shrinkage*, Radial shrinkage, 5.1%. Tangential, 11%. Volumatric figure, 162.	Of average durability so far as resistance to decay is concerned. Shrinks, warps and checks badly in curing; splits easily when being prepared for use as firewood. Since old trees rot badly this use may be important.	Hard to nail. Splits on nailing but holds nails well. Holds paint well. Bends with steaming. Excellent as fuel, with good heat value. Weighs 3234 lbs. to cord as firewood. 1 cord equals 1 ton of coal as fuel.	Used in floors, veneers, crates, railroad ties, tools and tool handles, cheap woodenware, baskets, fuel and general construction where coarse woods are acceptable and where protection is possible from weather.
44 lbs. per cu. ft. 12% H_2O, 56 lbs. per cu. ft. *Specific gravity*, 0.57. Hard, comp. figure, 115. Odorless or nearly so, finishes smooth, capable of withstanding blows well.	*Strength*, shock figure, 138. Bending figure, 114. Compression figure, 106. Stiffness figure, 178. *Shrinkage*, Radial shrinkage, 4.9%. Tangential, 9.5%. Volumetric figure, 147.	Not durable where decay is possible. Splits rather easily, splits and shrinks in curing. Hard to cut cross grain. One cord of fuelwood weighs 2864 lbs. If kept dry holds shape remarkably well.	Hard to nail and may split but holds nails well, wears well, intermediate for holding paint and glue. Excellent fuel value (68.75) giving much heat and good coals, inferior kindling. 1 cord equals 1 ton of coal.	Used in floors, as fuel, in railroad ties, piano frames, athletic goods, spindles, tool handles, woodenware, furniture, interior finish, cabinet work, pulley blocks, tools, toys, gadgets.
40 lbs. per cu. ft. 12% H_2O, 56 lbs. per cu. ft. *Specific gravity*, 0.49. Moderately hard, (115). Odorless, reasonably hard, finishing less smoothly than sugar or hard maple.	*Strength*, shock figure, 110. Bending figure, 93. Compression figure, 87. Stiffness figure, 158. *Shrinkage*, Radial shrinkage, 4%. Tangential, 8.2%. Volumetric figure, 128.	Not durable where decay is possible. Shrinks and cracks moderately in curing but more than does sugar maple. Easy to cut cross-grain.	Nails easily but splits in nailing. Holds nails well. Holds paint and glue but inferior to sugar maple. A good fuel, with value of 61.65, may be noisy in fire. Makes good coals. 1½ cords equals 1 ton of coal.	Used as fuel, in cheap furniture, for coarse construction where not exposed to the elements and particularly to water. Used in tool handles, cabinets, toys and gadgets.
28 lbs. per cu. ft. 12% H_2O, 38 lbs. per cu. ft. *Specific gravity*, 0.38. Soft, comparative figure, 40. Odorless, remarkably uniform in texture and in color of heartwood.	*Strength*, shock figure, 58. Bending figure, 71. Compression figure, 68. Stiffness figure, 135. *Shrinkage*, Radial shrinkage, 4%. Tangential, 7.1%. Volumetric figure, 119.	Not durable under ordinary circumstances. Shrinks much but holds size and shape well once it is cured. Splits easily and evenly. May swell when thoroughly wet.	Nails easily but holds nails poorly. Takes glues and paints well and holds them well also. Not ordinarily considered as a fuel wood.	Used chiefly in cabinet work, in pulp, wood turnery, toys, novelties, hat blocks, berry boxes, furniture shelves and for many general purposes where great strength is not required.
35 lbs. per cu. ft. 12% H_2O, 46 lbs. per cu. ft. *Specific gravity*, 0.47. Moderately hard, figure, 72. Little or no odor, works well. Takes good polish. Finishes beautifully and wears well.	*Strength*, shock figure, 112. Bending figure, 93. Compression figure, 100. Stiffness figure, 150. *Shrinkage*, Radial shrinkage, 3.7%. Tangential, 7.1%. Volumetric figure, 113.	Durable when cured and finished. Is usually free from excessive checking and warping in curing process but shrinks considerably all of which may be taken into consideration when using the wood for furniture.	Takes nails, paint and glue well and usually appears at its best when finished without stains. Of average fuel value (58.14) but too valuable to use anything but trim for fuel. 1 cord equals 1 ton of coal.	Used mostly as furniture, as mounts for electroplates, in cars, boats, scientific instruments, for interior trim. Too valuable for these purposes to be considered for use as fuel though it would be good.
43 lbs. per cu. ft. 12% H_2O, 57 lbs. per cu. ft. *Specific gravity*, 0.55. Hard, comparative figure, 86. Odorless, usually uniform, machines well and stands much abuse well.	*Strength*, shock figure, 171. Bending figure, 106. Compression figure, 98. Stiffness figure, 174. *Shrinkage*, Radial, moderate, 7.2%. Tangential, 9.2%. Volumetric figure, 166.	Not durable when decay is possible. Shrinks considerably when curing and may check badly in the process. Splits easily and evenly. May split in nailing. Takes glues and paints well.	Nails with difficulty. Excellent fuel with 65.34 heat value. One cord weighs 2368 pounds and equals 1 ton of coal as fuel. One of the better campfire fuels because of good coals and easy splitting.	Used for the most part in lumber, furniture, as window trim, in doors, flooring, railroad ties, interior woodwork of all kinds, as veneer, as window sash and, of course, as fuel. Wintergreen oil may be extracted.
26 lbs. per cu. ft. 12% H_2O, 41 lbs. per cu. ft. *Specific gravity*, 0.32. Soft, comparative figure, 31. With unique odor when wet or fresh. Works well ordinarily. Creamy color is characteristic.	*Strength*, shock figure, 54. Bending figure, 61. Compression figure, 62. Stiffness figure, 126. *Shrinkage*, Radial shrinkage, 6.6%. Tangential, 9.3%. Volumetric figure, 158.	Low durability where decay is to be expected. Shrinks much in curing but with little warping and checking. Splits easily. May be worked easily and well with almost any kind of tool.	Nails easily but splits. Holds nails poorly but takes glues and paints exceptionally well. Of low fuel value (45) and 2 cords equals 1 ton of coal. At 200 C. ignites in 9.6 seconds.	Used mostly in doors, window sash, carved articles, pails, barrels, excelsior, general cooperage and wood turnery, as drawer bottoms in furniture and in cabinets.

(Continued from page 25) since a radial face is what is exposed in *quarter-sawed* boards these boards are naturally more expensive.

Now, what are some of the characters we must recognize if we are to distinguish woods with any degree of certainty? Let us start with a cross section. The first things to notice are the annual rings. In some wood cut from huge logs, these seem to be almost perfectly parallel to each other. If you seek these rings in various woods you will see that they are not all alike. In general, they may be one of three general kinds. If the rings are conspicuously marked by alternating rows of large holes, or pores, and adjacent layers of more closely packed wood, we may say that the wood is a *ring-porous wood*. In this group, will be such woods as the oaks, ashes, locusts, hickories and hackberries. Should you be trying to learn to identify woods it might be well to go through the samples you have and try to put into one pile all of the woods that have annual rings marked by rather conspicuously alternating kinds of wood, one part being largely wood in which pores are easily seen, either with the naked eye or with a hand lens. The area with the large pores would be called the *springwood*, and the areas between the springwoods is spoken of as the *summerwood*. In this insert, are two paired pages showing how ten ring-porous woods vary in the appearance of their annual rings as seen with a lens that makes a magnification of 7½ times. To the right of each photograph is a sketch accentuating the differences that are important to notice in making an identification. To the right of this is information that may be of further use in confirming the conclusion you may have reached.

There are a few kinds of woods that may appear to be ring-porous because you can see the large pores relatively easily, and because they appear in rather indefinite rings. Since these large pores extend rather generously into the summerwood, it has been more or less agreed that such woods as the walnuts are to be considered as *diffuse-porous woods* rather than ring-porous. In most of the diffuse-porous woods the pores are too small to be seen, except with the help of a hand lens. In this group are such common woods as the maples, beeches, sycamores, basswood, tulip tree, birches, willows and poplars. Some of these can be distinguished only with great difficulty and are not considered in this elementary treatment of the subject.

In many woods the annual rings seem to be defined by particularly dense areas, with the intermediate areas composed of what seem to be fine, *continuous*, radial lines of cells. In many of these woods, the annual ring may not be defined, but the main part of the wood does seem to show these continuous radial rows of cells, often too small to be recognized even with the aid of a lens. Such woods are spoken of as being *non-porous*, and included in the group are the cone-bearing trees such as the pines, spruces, firs, hemlocks, cypresses, redwoods and the like. So we provide a pair of pages showing diffuse-porous woods, and another pair showing some non-porous woods. It will be much easier to see some pores with a hand lens in the diffuse-porous woods than to see anything you might think of as pores in the non-porous woods.

Besides the annual rings and the pores, or general nature of the wood, there are a few other points that must be noticed, or which will be useful in identification. Our notes speak of *rays*. These, of course, are the structures that seem to run along the radii from the center of the tree towards the outside. These vary in size from the enormously conspicuous ones found in such woods as the oaks, sycamores and beeches, to others in which they may be just visible to the naked eye, or even down to those that can be seen only with difficulty with a hand lens, or not even then.

Another group of structures appear frequently in the non-porous woods. These are the *resin ducts* and the *resin cells*. As these names imply, they refer to scattered structures that appear to be resinous. The notes on the non-porous woods will point out how these vary in the different species, and how their presence will help you to consider that a wood being identified is what you may temporarily have concluded it to be.

Once you have made a tentative determination you may wish to check your conclusions further. The notes given here should help you. With their help, you should be able to get some idea of the relative weight, hardness, color, odor and durability of the different woods. You may form some judgment as to whether a given wood will be likely to contract greatly, or but little, when it is cured; whether it is likely to warp, split, rot, check or otherwise change after it has been put to use. This is highly important to know, particularly if your house may have been built of poorly seasoned woods, which, as time passed, tended to shrink, sag, warp, and otherwise pull themselves out of shape.

You may use the figures given in the table section in some manner such as this. You can, if you wish, test different woods as to their relative hardness by trying to crush one with the other. Or you may save yourself some time if you look through the chart and make a list in which you place the hardest woods first and the others on down to the softest. In some cases, the figures given to describe various qualities of woods have been given in percentages, as in the matter of radial shrinkage. But, in most cases, a series of comparable figures have been given in which the highest figure represents emphasis on the character indicated. With this to go by, you can now determine in advance the probability of one kind of wood shrinking more or less than another. You will note that strength has been considered variously, and that while some kinds of wood show better strength so far as bending is concerned they may not be so good so far as crushing is concerned. Still others that may be superior in the figures given for strength are described as being unable to withstand decay. This must be taken into consideration if you propose using a piece of wood where it may be exposed to the weather, rather than in some protected place safer from decay.

What About CVA?

DURING the past year we have read a great deal, pro and con, about the proposed Columbia Valley Administration. We have discussed it with proponents and opponents. We have received press releases and pamphlets salted with half-truths and some falsehoods from the antis; and releases and copies of speeches from the pros that apply a certain amount of gilt to the lily. We have detected in some of the pronouncements of the opposed groups the invisible finger-prints of equally opposed power interests, which prefer to express their opposition through stalking horses. We have found in some of the governmental claims for CVA Messianic complexes that are on the smug side, and not always as frank as they might be.

Certainly the CVA issue is going to become warmer when Congress returns to its labors. Claims and counter-claims will then fly thicker and faster; become more distorted as they are warped in the heat of the argument. What we have been trying to arrive at is some cool and objective opinion.

We must admit, at the outset, that we have gradually arrived at the conviction that cooperation between States in the solution of such problems as CVA seeks to solve, more often than not, is ineffective, snail-like and inadequate. We believe that State lines are too often trip-wires when it comes to settling the conservation issues of a regional unit such as a watershed. We are convinced that coordinated handling of all the natural resources of such a geographical and biological unit offers the only answer. Inter-State coordination having, in our opinion, failed to prove itself, some broader plan — in vision, planning and technology — must be invoked. Whether it is CVA or some other combination of initials is not too important.

In the Columbia River Valley today we have the U. S. Bureau of Reclamation, busy on large projects. We have the Corps of Engineers zealously promoting its dam-building plans, and the Bonneville Power Administration operating a going concern. The programs and properties of these three would be blanketed into the CVA under proposed legislation. Also, various bureaus of the Federal Government — U. S. Forest Service, Soil Conservation Service, Fish and Wildlife Service and others — have long been carrying on extensive activities in the Columbia Valley. Their functions would not be taken over by CVA but coordinated into its over-all conservation and development plan for the area. Such a plan the CVA would be charged with preparing, basing it upon consultation with all Federal, State, local and private agencies in the region.

One of the most anguished cries heard against CVA is that it would create a board of three, appointed by the President and responsible to him and to the Congress. The fear of Northwest opponents appears to be that this triumvirate would not be responsive to local opinion and interests. One group of sportsmen is shouting to the heavens that this trio of dictators would take over all the game animals, wipe out the State fish and game commissions, and do away with present Federal-State programs of cooperation in game management. We think they are unduly alarmed. Under the provisions of CVA legislation advisory groups in the various related conservation fields would be created. Their advice must be sought by the administrators, and while there is nothing in the legislation that would make the advised accept the opinion of the advisors, the views of the latter must be included in the report of the administrators to the President and the Congress. In the interests of a coordinated approach to conservation, advisory groups might well be given greater standing, but, even so, the administrators of any such agency as CVA would be continually on trial before Congress. In self-protection it would seem that they would have to be responsive to local views.

In the Northwest we have seen a tremendous increase in population. Much of this was war-born, but most of the new people are there to stay. The demand for productive land has increased; power needs to service new industries, which will provide steady employment for increased populations, have grown beyond available supply. These needs could be met, without doubt, by the reclamation projects and power development now in progress or in plan. But, in the meanwhile, the top soil of other rich lands washes down the rivers for lack of an integrated soil conservation program and funds to carry this through. Denuded watersheds erode for lack of funds to reforest, as a part of an over-all plan. Fish and wildlife suffer as a by-product of both of these situations.

We are opposed to super-governments and dictatorial tendencies, whether regional or larger. At the same time we are convinced that the waste of natural resources, the bickerings of political jealousies dictated by the economic and biologic illogic of State boundaries are costly in money and in those resources. Some formula must be found — and soon — to treat natural resource management on a broader and coordinated basis. It is in the interests of not only those in the region involved, but of the whole people — who pay the bills — to do so. It may be that the CVA legislation as it now stands does not provide the ideal answer. Nevertheless it does represent the essential basic approach. If the opponents of the specific proposals now before the Congress would exert as much energy in constructive suggestion as they now do in blind and often uninformed opposition, there would be happier prospect of a solution vital to all of us.

Burchell's zebras and brindled gnus in Nairobi National Park. Ordinarily shy wild animals, after a few years of protection from shooting they have nearly lost their fear of man.

Wildlife Parks of East Africa

By DAN LINCOLN THRAPP

THE OLD hunter nodded toward the prairie beyond Nairobi. He said, "I've seen those plains absolutely black with thousands upon thousands of head of game. Now you can travel all day and not see any. None at all. The game is fast going." Another experienced observor said, after a detailed survey of East African faunal regions, that "it is probable that the wildlife areas have been reduced by half, and the wildlife within many of those left by 75 percent" in the past 50 years.

As happened in America in the last century, the battle in Africa against the native fauna sweeps on, gaining momentum, and today threatens the very existence of some species. The campaign of extermination is waged on many fronts. In the Rhodesias, in Tanganyika and in Uganda, slaughter programs against game animals are considered a weapon against tsetse fly. In Tanganyika native hunters armed with muzzle loaders kill an estimated 180,000 head of wildlife a year. Poachers with poisoned arrows kill several times that number annually in East Africa. Recently, for instance, some Wasukumu tribesmen killed 200 wildebeests with poisoned arrows during one night from a single treetop stand. They took the tails from each animal, with which to make ornaments, cut a little meat from one gnu and abandoned the other carcasses. The incident, illustrating the wastefulness of their illegal activities, is multiplied manyfold through East Africa each year.

During the war, upwards of 60,000 Italian war prisoners and 10,000 Ethiopian refugees

Over the main entrance to the national park is a message from King George VI reading: "The wild life of today is not ours to dispose of as we please. We have it in trust. We must account for it to those who come after."

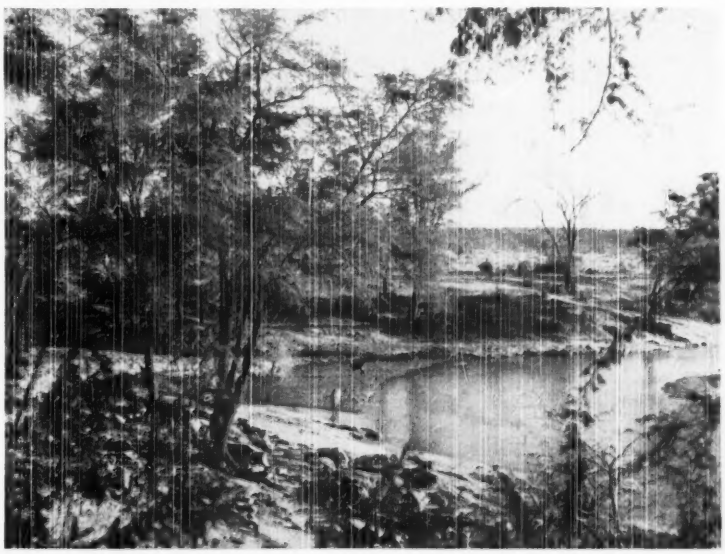
Half-submerged hippopotamuses in the crystal-clear waters of Mzima Springs in Tsavo National Park. These pools are so clear that the animals can be photographed under water.

were fed in large part on oryxes, kongonies, gazelles and other animals. Today, in the more popular hunting areas of Kenya, "safaris are going the rounds like golfers on crowded links," to quote one observer.

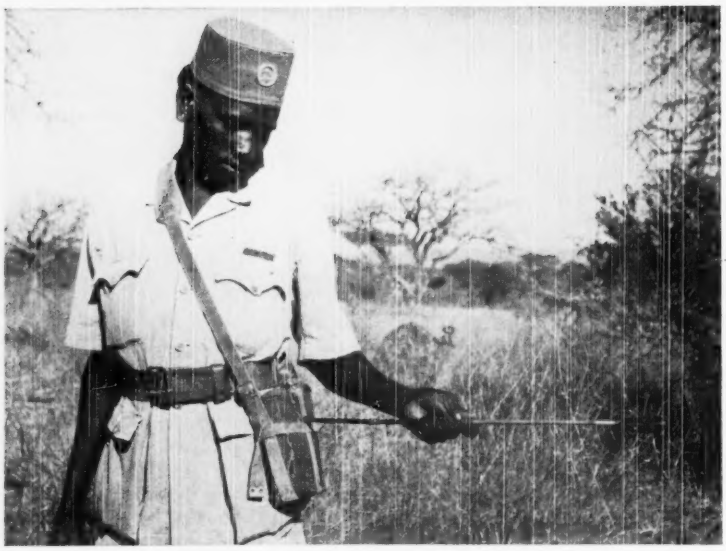
The belief that wild animals and agriculture are incompatible spreads rapidly, and there are not a few voices urging the swift liquidation of large wildlife areas as the best means of promoting African economic development. But, on the other hand, there are many people, and perhaps they are in a majority, interested in preserving as many animals as practicable, and in protecting the faunal glory of Africa for the benefit of future generations. It is to these people that is largely owed our thanks for the delimitation, maintenance, and expansion of the few national parks and wildlife sanctuaries thus far created in Africa. Exactly what is being done? Are the wild animals really being protected? Let us see.

Although some steps toward establishing African parks were taken long ago, a mandate for their creation derived only from the International Convention for the Preservation of Fauna at London, in 1933. The conference was attended by Belgium, Britain, France, Portugal and other interested powers. Steps were taken almost immediately thereafter to establish national parks.

Perhaps the Belgian Congo has advanced farthest. Even under the pressure of war, it refused to allow prospectors to probe its wilderness sanctuaries in search of gold or uranium. Those animal retreats remain today the reserves they were intended to be when created. Most famous, of course, is the Albert National Park, the only one open to the general public. It extends from Lake Kivu north, past Lake Edward and into the beautiful Ruwenzori mountains. The large Garamba Park along the Sudan border in the northeastern Congo is a refuge for the threatened white rhinoceros. The Upemba National Park, north of Elizabethville on the upper Lualaba River, is the largest and least explored in Belgian territory, and the Kagera park, on the Tanganyika border near Lake Victoria, is a refuge for the mountain gorilla and other rare rain forest species. It is a remote part of Africa. The Kagera River is considered the ultimate source of the



A male waterbuck drinking at a secluded spot above Lugard's Falls on the Athi River, with two does nearby. The site is also a popular watering place for elephants.



Wildlife Ranger Kinomo Killile shows where a poisoned arrow from the bow of a poacher hit his water bottle, allowing him to live to catch two native poachers soon after.

Nile, and this headwater was not discovered until 1898.

The Belgian attitude toward their parks is that they should be entirely unspoiled wildernesses. Natives living in the area are encouraged to move elsewhere. They are forbidden to fire the grass within park boundaries — an old African custom. No hunting and no fishing is permitted, sick and wounded animals are left to live or die as Nature wills it, and in most parts of the parks even Nature photography is not allowed. This is because the authorities believe camera fans would unduly disturb the wildlife, particularly such comparatively sensitive types as the gorilla and the white rhino.

British experts have views almost diametrically opposed to those of the Belgians. In park-conscious Kenya every effort is made to "domesticate" the animals. Viewing towers are built for the benefit of tourists, roads laid out, water holes and salt licks created, and everything done to attract ever more numbers of the popular species. Wild hunting dogs, however, are ruthlessly exterminated. The British, one might say, like their parks well tended and comfortable; the Belgians like them rough and rugged. The end result, for the wildlife at least, is intended to be the same — a refuge where it needs fear no bullet or arrow. That is the desired result, but it falls far short of being attained in many parts of East Africa.

Justly famed is the Nairobi Game Park, twenty minutes drive from downtown Nairobi. Here, with luck, one may see two dozen kinds of carnivores, including lion, leopard, cheetah, and hyena; a score of herbivores, among them zebras, giraffes, wildebeests, hippos, Grant's and Thomson's gazelles, impalas, dikdiks, the smallest of East African antelopes, and waterbucks, numerous rodents, monkeys and baboons; a score or more types of reptiles. This park has only forty square miles, but its waterholes and salt licks entice animals from a large reserve that extends from its southern border far down into the Great Rift Valley, and the amount of wildlife that can be seen there in an hour or two is amazing. An average of 4000 people a week visit the Nairobi reserve, and the animals have become so convinced of the harmlessness of autos that most species will stand for a close inspection.

Yet the park is so small as to be almost a glorified zoo, rather than a wildlife sanctuary. It was partly for this reason that the giant Tsavo National Park, of some 7000 square miles, was created early in 1949, to be primarily a sanctuary. I was fortunate in being permitted to accompany the Chief Game Warden of Kenya on his initial survey trip to investigate the area's possibilities, and saw at first hand the tremendous problems facing conservationists in modern Africa. The Tsavo Park, named for two famous man-eating lions, which by their depredations once halted work for three weeks on East Africa's first railway, was established under provisions of the 1933 convention as an area "placed under public control where preservation of wildlife is the primary object and provision of facilities for the public to see and enjoy such wildlife is a secondary object."

The Tsavo area is a neglected, semi-desert belt between the coast and the highlands, broken here and there by rocky, inhospitable-looking and superstition-haunted mountains. It is watered by two main rivers and a number of creeks, most of them intermittent. Much of the area is overgrown with thorn scrub, which furnishes good cover for wildlife, but hampers efforts of visitors to see the animals, and makes driving on the narrow, red dirt tracks pretty hazardous. We were charged at close quarters by one elephant and a pair of rhinos, and roadside brush clearing must be done before the trails will be safe for tourists. The region is far from ugly, however, and after even a moderate rainfall it bursts into a profusion of flowers, while the silver-gray brush turns a bright green and leafs out, making the countryside for a brief time an emerald wonderland.

This new park is well stocked with wildlife. Estimates of the number of elephants on it run to 10,000

A cow elephant photographed from a truck on a new road through Tsavo National Park. She charged the truck just after the picture was made, apparently concerned for her calf.

head, but I believe this to be a many-fold exaggeration. It is certain that thousands of elephants are sometimes found there, but I think that most are seen during the yet uncharted migrations between Mount Kenya and Mount Kilimanjaro via the Tana River and the Yatta plateau. Wildlife officials intend to study these mysterious migrations by marking individuals with paint. The color will be applied by shooting the elephants in the stern with arrows tipped with paint-daubed cotton wads. The paint will remain for up to a year, and simple observation will tell much of the animals' movements.

Thousands of rhinos, hundreds of hippos, and tens of thousands of other game species now live within the confines of the park. On a single day we saw lesser kudus, elands, zebras, elephants, baboons, monkeys, gerenuks, waterbucks, buffaloes, dikdiks, impalas, oryxes, bush babies (galago), and had a lion call on us in camp. But the animals are extremely wild and difficult to see, because of heavy hunting in the past and continued poaching today. Many of the poachers are Wakamba, little forest people who kill elephants and smaller animals with strychnine arrows, their fresh poison being capable of slaying a large elephant before he runs 500 yards. Some poachers are dangerous characters. Game Ranger Kinomo Killile had a narrow escape recently when a poisoned arrow struck and penetrated his canteen. He caught two Wakamba, but both professed innocence, and since he had not actually seen them fire at animals, or at himself, they were let off with a warning. The Tsavo area, too newly proclaimed to be well policed, is over-run with poachers, and some magistrates, not too enthusiastic about national parks anyway, are lenient with renegade hunters and are little help to the authorities. One warden estimated that 8000 pounds of ivory were poached from his section of the park within a few months. That would represent about 100 elephants, mostly mature bulls. But he recovered some ivory that had been taken from a ten-year-old elephant killed by Masai spearmen — an unusual event, since the Masai are not by nature poachers. Illegal ivory is sold for a fraction of its public auction value to smugglers, who load it on Arab dhows at the coast, whence it finds its way to the insatiable Indian market, avid for ivory.

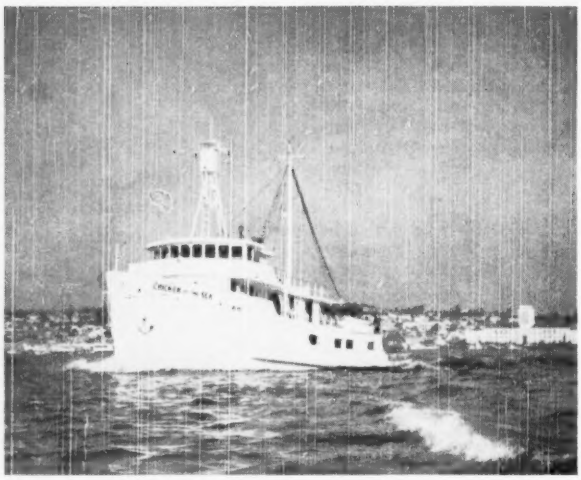
Poaching will continue to be a major concern of the Tsavo authorities for years to come. Little of the park's boundary has been adequately defined, because there are not funds sufficient for that purpose. Much of the northeastern boundary runs through unmapped wilderness, and patrols must be made on camel back. Outlaw hunters find it easy to avoid these patrols.

On the southern and eastern borders, where the park includes wide, grassy plains, to which the wildlife is beginning to return after heavy wartime hunting, poaching is at a minimum. It is planned to add a thousand square miles to the park in this region, and much of the well known Amboseli dried lake beds may eventually be included. These mud flats and prairies, at the northern base of Kilimanjaro, are a wildlife photographers' paradise, but even here the ungulates are becoming wary because of the practice of unscrupulous guides of shooting zebras, wildebeests, or gazelles for lion bait for their camera parties. During our stay hungry lions, perplexed at our neglect of them, grumbled all night outside our camp, urging us to shoot them some meat.

Amboseli now is part of the Southern Game Reserve, which, with the Northern Game Reserve just south of the Ethiopia-Sudan frontier, has been a major factor in preserving such large wild animals as Kenya boasts today. Unfortunately, the Southern Game Reserve is to be liquidated soon, because the Masai need more grazing lands. Some of it will be added to the Tsavo National Park, a portion will be made into a national reserve (more rigidly controlled than a wildlife reserve) and hooked on to the Nairobi National Park, and part of it will be opened to hunting again. This was a regrettable, but apparently an inevitable decision.

Besides these parks and re- (Continued on page 50)

A tuna vessel. One hundred million dollars worth of such vessels are afloat. Other figures in the tuna industry are spectacular. Production has doubled on the average of every eight years since the inception of the fishery; some tuna vessels cover as much as 9000 miles on a single cruise, and vessels cost as much as a half-million; on a single trip a vessel will bring in as much as 600 tons of tuna, worth $200,000; a third of a billion cans of tuna produced last year had a wholesale value of more than $125,000,000. So tuna fishery is, indeed, big business; its maintenance is important to our economy and to our stomachs. Thus it is vitally necessary to find the answers to many questions about . . .



America's Problem-Fish

By MONTGOMERY PHISTER

THE scramble for tuna is on.

California's great tuna fleet — dollar-wise the nation's most valuable collection of fishing vessels — spends ten months each year combing the seas from San Diego to Patagonia, searching for tuna.

From Texas comes new-born competition, a million-dollar threat. A refrigerated mother-ship and three clippers from Houston now fish the banks off the west coast of South America.

Other nations, notably Russia and certain Latin American countries, eye the tuna fishery covetously. And Japan, always America's Number One threat, is at sea again with a bigger, revitalized tuna fleet, thanks largely to American aid. Already Japanese-exported tuna are pouring into the United States over a tariff wall, which, domestic fishermen protest, is far too low.

To tuna boat owners and fishermen, these problems are a headache. But to fish biologists, the scramble for tuna suggests an even more pressing problem — the urgent need for research, and for conservation controls.

America, too, often has suffered the aftermath of overfishing. Only the most careful nursing has revitalized our halibut and salmon fisheries, saving them from total destruction. Haddock and cod industries today face critical futures. Experts remember, too, what happened to the sea otter. This sleek, fur-bearing animal whose pelt was highly treasured in the nineteenth century by dandies of the Russian court, was virtually extirpated by profligate fishing. Yet, despite a U.S. law that for fifty years has prohibited possession of a sea otter pelt, these animals still are rarities. Their habitats are secrets guarded by Fish and Wildlife Service officials.

Neither the fisherman nor the biologist knows much about tuna. Despite the fact that tuna, as a food, was as familiar to the ancients as it is to twentieth-century housewives, the "tunny" remains a mystery fish.

Among the puzzlers marine biologists would like to solve are these: Where and when do tuna spawn? Where are the tuna's centers of population? Why do cetain tuna turn dark, then light? Why will not the bluefin tuna take a lure? Why did albacore vanish suddenly in 1927, to reappear just as mysteriously off the Columbia River in 1937? To what never-never land did they retire in the ten-year interim? Do West-coast tuna belong to the same populations that roam Hawaiian and South Sea waters?

If and when biologists solve these and other problems, then they may suggest an answer to the industry's jackpot question: How much tuna can we haul from the ocean each year without destroying Nature's delicate balance between abundance and depletion?

Except as sportsmen and hearty eaters, the American people have never expressed much interest in fish. We not only have been asleep to the potentialities of our fisheries as food reservoirs; we likewise have lacked appreciation for them as a kind of high-seas Annapolis for training seamen. Most great maritime countries recognize in their fisheries a fruitful and perpetual training ground for sailers; a vital reserve to call on in time of war.

Among the world's great maritime powers, the United States has long been a standout for niggardliness and shortsightedness when it comes to fisheries research. America is the only important maritime nation without

adequate facilities, yet our coastlines outstrip, both in mileage and potentialities, the coastlines of most other nations.

Fishermen of both Russia and Japan have this major advantage over our own — both the Soviet and Nippon appreciate the top-ranking importance of high-seas fisheries to national welfare. Both, therefore, actively promote and aid expansion of fisheries by providing adequate scientific information about oceanography and movements of fish.

Until now, Washington has shown little interest in or understanding of fishery problems. The State Department, under former Secretary Stettinius, cataloged fisheries as "commodities," placing them under the same category as hogs, oats, and grains.

But a fishery is *not* a commodity. A fishery is a resource, together with the right to take and to control that resource. Its problems lie within the realm of international law whenever, as in the tuna fishery, vessels go beyond the three-mile limit to fish.

Montgomery Phister is executive vice-president of Van Camp's, perhaps the largest producer of tuna in the world. He is also a conservationist, and he was chosen to use his leading position in marine fisheries of the Pacific Coast for the welfare of those fisheries and of the Nation. He has been a driving force back of management and research in this field, and in the organization and work of the Pacific Fisheries Conference. His influence was a major factor in negotiating and obtaining ratification of two tuna conservation treaties — with Costa Rica and Mexico. These represent important steps ahead in management of our tuna fishery.

For nearly fifty years after the Pilgrims landed, America nurtured her fisheries. Then agriculture and industry began to flourish, and fisheries faded into the background. They have stayed in the shadows of neglect ever since.

Now, almost too late, we are awakening to their importance. Americans, proud of their country's "limitless" resources, are shocked to learn that their resources not only are exhaustible, but that they actually are diminishing annually. This becomes especially alarming when we realize that, thanks to advancements in medicine and other sciences, America's population increases on the average of one percent per year. Translated into figures, this means that another 1,500,000 mouths must be fed next year from U.S. food resources, which then will be smaller than they are now.

Finally, after nearly 150 years of lethargy, our government begins to stir. Certain preliminary developments are encouraging. The Tydings and Farrington bills, providing for research into Philippine and Hawaiian fisheries, respectively, are among concrete evidences of activity. Government-sponsored explorations into the South Pacific recently brought back data, and more voyages are scheduled. These activities are heartening, but they must be followed by more ambitious programs.

Probably the most significant advance was recent appointment of Dr. Wilbert M. Chapman, eminent fish biologist from the University of Washington, to a high-echelon post with the State Department. Dr. Chapman, a respected and competent young scientist, brings new life to the tuna industry's hopes for government cooperation and, where necessary, intervention.

The task facing Dr. Chapman is formidable, for he comes in to shut the barn door after the horse has fled. But under his able leadership, many significant advances have been made already, and more progress is in the offing.

How does the United States compare with Russia and Japan with respect to fishery research?

"When it comes to fishery research," former Interior Secretary Krug declared recently, "the Soviet Union is ahead of us six to one. Six Soviet research vessels are out in quest of new fishing grounds. We have just one — on the east coast."

The secretary tells only part of the story. For decades, Russia has plunged ahead in research. At last report, the Soviet's Central Scientific Institute of Fisheries in Moscow and at least three other major laboratories were working around the clock, aided by some thirty smaller institutes and stations scattered throughout the Union. Bolstered by a budget reportedly in excess of $15,000,000 annually, some 500 scientists and about 1000 other workers were employed full-time on this program. One important laboratory was the Pacific Ocean Institute at Vladivostok.

While themselves maintaining an airtight security, Russia's scientists eagerly probe our own findings. Within the past year, Professor Alexander S. Bogdanov, director of Moscow's Research Institute of Fishing and Oceanography, toured the United States with an interpreter, stopping, among other places, at California's Fish and Game laboratories at San Pedro to pry into the excellent research findings there.

It would probably be safe to conclude that the United States has not spent in the last 100 years as much as Russia spends in a single year on fishery research.

And, ambitious as it is, Russia's research fleet would appear puny indeed beside Japan's pre-war research armada. Prior to World War II, Nippon operated at least *fifty* ocean-going research vessels in the Pacific, five of them in the Mandated Islands on bonito investigations alone.

At that time the United States was operating *no* fishery research vessels, period!

Adding coals to these flames, Uncle Sam sent research boats to Chile and Peru to help them survey their fisheries. And American canners, seeking crumbs from the table, asked Washington for copies of the survey's findings. Washington could supply none; the industry was forced to send to Chile and Peru for duplicates.

America's tuna vessels have not yet ranged beyond the Hawaiian Islands to probe into the great wealth of the South Pacific.

Under terms of a State Department directive issued last fall, territorial waters surrounding the so-called

Trust Territory now are "open to the commercial fishing enterprises of all nations on a non-discriminatory basis. . ."

At present, "all nations" does not include Japan, whose government will have no international standing until a treaty of peace has been negotiated. But observers agree that Japan will exert every conceivable pressure to gain entrance to the Trust Territory *now*.

Our fishermen know too much about Japanese fishing methods to believe the Nipponese ever will practice conservation. Japanese fishermen seem constitutionally incapable of conservation. Former Interior Secretary Ickes once observed that Nippon's fisherman has always been "exploitation-minded rather than conservation-minded."

To permit Japanese to fish the Trust Territory at this time, or in the near future, before control and policing procedures have been organized, would almost certainly put the death sentence on tuna populations in the area. And even if conservation controls are instituted, to which other nations, including Japan, become signatories, can we depend on the Japanese to observe them? Experience proves otherwise. Already our occupation officials in Japan have been required to reprimand Jap fishermen severely for infractions of regulations, and for fishing out of authorized territory.

Because of the vital importance of tuna as a source of protein, our nation should help its tuna industry to exploit this new, rich reservoir. But proper exploitation involves more than loading a tuna clipper with fishing gear and shoving off for the South Pacific. Many problems must first be explored and solved, for fishing tuna in the Territory will call for techniques to which our present fleet is not adapted. Bait is scarce there, for example, and we may be forced to employ set-line methods instead of the familiar lure-and-pole procedure.

So first must come research, bringing answers to the scores of problems that puzzle the biologists. This research is a government, rather than an industry responsibility.

Dr. Chapman, addressing a recent meeting of the Pacific Marine Fisheries Conference at Bellingham, Washington, said prophetically:

"What America does in tuna research in the next five to ten years may decide whether or not we have a tuna fishery thereafter, politically as well as biologically."

Concurrent with research, or prior to it, must come government action on the policy level. Agreements should be concluded with other nations on conservation, policing and exclusion of predators who break the rules.

Failure of the United States to provide proper research tools could put the seal of doom on the tuna industry, and on a much-needed source of protein. Such a debacle could, in turn, hasten fulfillment of the scientists' grim prediction of a foodless world to come.

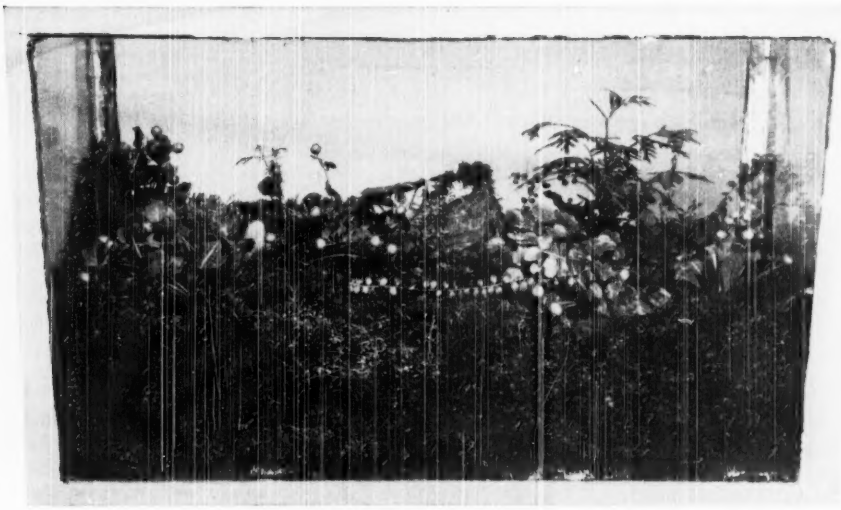
Lily of Many Names

By BETTY H. HUNTRESS

PROBABLY the most spectacular of all western wild flowers is the Washington lily, *Lilium washingtonianum*, which can be found at high altitudes all through the Cascade mountain range of Oregon, and into the Sierra of northern California.

So admired is this fragrant lily, with its waxy pink and white trumpets held tall on a proud stalk, that it is called by many names throughout its range, each locality jealously claiming the lovely flower for its own. Northern Oregon calls it "Mt. Hood lily," and it appears at the right with Mt. Hood in the background. Farther south, near the headwaters of the Santiam River, it becomes "Santiam lily." Southern Oregon names it after Mt. Pitt, and over the state line in northern California it is known and loved as the "Shasta lily," for beautiful Mt. Shasta.

Fortunately this wonderful wild flower is protected in national park areas, but it has already almost disappeared from some areas where it used to be abundant. It domesticates easily, which accounts for part of its decline in the wild. If you search the mountain slopes, however, almost any time from June to August, you may still have the rare pleasure of finding this regal beauty, sometimes even growing in patches of considerable size. It seems to flourish especially well on logged-off or burned-over forest land, as though Nature tried to grace the most forlorn spots with a lovely flower.



Green mosses line the sides of the terrarium. In the miniature jungle are seedlings of cedar, the twin-flower, partridge berry, rattlesnake plantain, club moss and a bit of reindeer moss. There are many shades of green and the scene is spiced with scarlet berries.

Terrariums as a Hobby

By ELIZABETH BACHMANN

TERRARIUMS have been in use for more than a century; since 1829, to be exact. To be sure, they were not known as terrariums at first, but were called "wardian cases" after Dr. Nathaniel Ward of London, who originally experimented with the growing of plants in a glass container.

In a corner of his garden Dr. Ward had carefully planted mosses and ferns that he earnestly desired to grow, but the smoke and fog killed his plants, one by one. Then, quite by accident, he discovered a method of raising plants successfully in the smoky, foggy atmosphere.

He had found the cocoon of a sphinx moth, and placed it in a large-mouthed glass jar, along with some rich damp loam. So that the moth might not escape when it emerged from its cocoon, he placed a cover over the mouth of the container.

Within a few weeks, to his surprise the furry curl of a tiny fern and other small green plants made their appearance and continued to grow in the covered jar. He enthusiastically began to experiment with many plants.

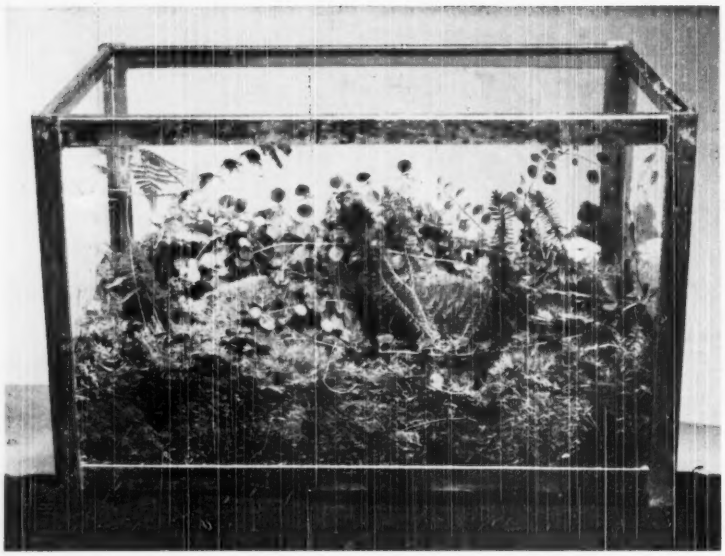
The final development was the use of glass containers in transporting plants to and from foreign countries. In the days of sailing vessels such voyages lasted many months. The first trial of the wardian cases was in 1833, when two cases filled with plants were shipped from England to Australia, emptied, refilled with Australian plants and sent back. The plants were not watered once during the long voyages, and arrived in a perfectly healthy condition.

The wardian cases, better known as terrariums, glass gardens or crystal gardens, now have been put to decorative, scientific, and practical uses. Many temperamental seeds that balk at flower pots will germinate in the humidity of a terrarium, and cuttings will root readily in them.

To construct a terrarium for decorative purposes, choose an aquarium, preferably a rectangular one, and have a sheet of glass cut to fit the top of it. Perhaps you have an old picture frame from which you can use the glass.

The container may also be a round, glass fish bowl, a glass teapot, or an apple or pear-shaped glass bowl. The glass, however, must be clear and not tinted, or the plants will not thrive, and there must be a lid or cover. Have the glass clean and shining before you start to plant.

A mixture of loam, sand and peat, or leaf mold to a depth of about two inches is used for the larger containers, and sphagnum moss alone for the smaller ones. The soil should be sterilized, by baking it in an oven at 400 to 475 degrees, in order to kill all insect life that may injure the terrarium garden after it is planted.



Ingenuity, and a seeing eye when one is wandering in the woods or near a swamp, will combine to provide an ever-interesting landscape in the terrarium.

To keep the soil sweet, a handful of charcoal is placed in the bottom. For drainage, pebbles, gravel, sand, or broken pieces of flower pots are used. The sides of the container should first be lined with green moss so that the green will show through the glass and the soil be hidden from view. Then add the charcoal, pebbles, and the soil mixture.

Gathering the plant material is the most delightful part of the planting of a terrarium. It will mean a trip to the woods, or to a cedar swamp. Gather soft green moss — the varieties that grow on soil for planting on soil, and the varieties that grow on wood for lining the container. Bring home the smallest seedlings you can find of spruce, pine and cedar.

Liverworts with their funny little fairy umbrellas are an interesting addition. The club mosses, both the trailing kind as well as the one that looks like a diminutive Christmas tree, should not be overlooked. Be sure to include the lovely little rattlesnake plantain with its prettily marked, gray-green leaves and slender spike of blossoms or berries.

Mnium moss makes a good background for all the other plants and mosses. As likely as not, you will find it growing in a shady part of your own yard, as well as in damp woods and swamps. There are an amazing number of mosses; hundreds and hundreds of them. Every state in the Union has its mosses. Many mosses found in North America are also prevalent in Europe and Eurasia.

The curved capsules, or spore cases, of the mosses — like pointed pixie caps on yellowish-or reddish-brown hairlike stalks — are a delight to behold. No moss has either flowers or seeds, as all of them are propagated by spores.

Small hummocks of lime-green moss, which look like pin cushions, may be lifted up intact and carefully transplanted to the terrarium. Some mosses, upon examination, are like miniature ferns or infinitesimal trees, and a microscope will reveal leafy structures, rounded, pointed, crinkled or serrated.

Mosses are found on mountain slopes, high above timberline, and on the sand and on rocks at the seashore. Mosses of the most brilliant green and of a velvety softness, which I found beside a little mountain stream in Colorado more than twelve thousand feet above sea level, and dry brittle mosses from tundra slopes, were both brought home and put into a terrarium. Both were lovely for a while, but it was too dry for one and too humid for the other.

Once you have grown a glass garden, however, you will find it impossible to walk through the woods or swamps anywhere without seeing plants for your terrarium. If they are small enough, no matter what they are, they seem to be desirable.

The crisp, gray lichen called reindeer moss is a delightful touch of contrasting color. It is apt to mildew if there is too much moisture, however, in which case it will just have to be removed and replaced with something else. Red-tipped moss is also a lichen, but the bright red fruit cups add color to the composition.

Tiny vines often found climbing over hummocks of moss in a swamp are among the most appealing of plants for the glass garden. Most satisfactory of all is the partridge berry with its white-veined, small leaves and shiny berries of vivid scarlet. It is worth a long search through the woods just to obtain a few vines. No terrarium is really complete without the partridge berry. Any terrarium is quite complete with nothing else in it. I know of a terrarium of mnium moss and partridge berries that was green and thriving for four years.

In this terrarium the partridge berries produced their tiny, waxy-white, bell-like blossoms. They were pollinated by hand, with the aid of a magnifying glass and a toothpick, and small berries eventually developed, although they did not attain the brilliant coloring that they would have outdoors.

Choose the smallest ferns you can find for the crystal garden. Under an overhanging rock you will often see

the tiniest ferns with delicate fronds not more than an inch or two in length. These are ideal for the terrarium. The little polypody fern will also do well.

Try pipsissewa, or prince's pine, and bog wintergreen. It might also be interesting to have the gleaming white ghost plant, or Indian pipe, if you are so fortunate as to find it, but if you do, be sure to take with the plant enough of the decaying wood on which it is growing.

Goldthread, the little star flowers, ladies'-tresses, and the single-flowered pyrola all grow in damp, mossy woods and bogs, and should be suited to terrarium life.

The little sundew — which ensnares insects in its honeyed embrace — grows on floating bogs and sphagnous places and should do well in the moist air of a terrarium. The pitcher plant will also thrive, but because of its size, and since it must be planted in a pot standing in water, it would require a large terrarium of its own.

Sometimes you will see a spot in the woods that is a miniature garden, all planted and arranged by Nature's artist hand. You have only to take it up intact and place it in your terrarium. In that event, do not leave the gaping vacancy without covering it with leaves to hide the spot where you have borrowed from Nature.

When the planting of your crystal garden has been completed, wipe the glass clean, inside and out, so that it sparkles. Spray the plants with a very fine spray before putting on the cover, and your dew-crystaled garden will be ready for enjoyment.

When the cover is kept closed, moisture, which is transpired by the leaves, condenses on the top and sides of the case during the day, then drops down and is absorbed by the soil in the night. This is influenced by the temperature, light, the moisture in the soil, as well as atmospheric pressure. For example, when the temperature is high, the rate of transpiration is high also. Terrariums need additional watering only at long intervals. When they do, it should always be done with a fine spray.

To prevent clouding of the glass with too much moisture, and to prevent mildew from starting, the lid may be tilted slightly by placing a match stick under one corner. This should allow sufficient air to penetrate.

At the first sign of mildew, more ventilation should be given. Occasionally excess moisture may be wiped from the glass. Mildewed plants should be removed and replaced; withered leaves and old mosses, too. If some plants grow too tall, trimming must be resorted to.

The terrarium also has its tiny enemies, in the form of slugs, aphids and earthworms. Occasionally a snail finds itself included in the leaf mold, but it can easily be removed. If you notice slimy trails on the glass in the morning, look for slugs and take them out.

An earthworm looks startingly huge in a terrarium. The scale of the garden is so small that an ordinary earthworm has the appearance of a python in the miniature forest. Be sure to remove the fellow.

Chinese pagodas and bridges, as well as tiny birds and mammals are sometimes set among the plantings, but to me they invariably look artificial and out of place, unless, perhaps, it is the type of garden in which they actually belong.

A forest garden, with the plants arranged informally in an irregular landscape of hills and valleys, usually gives the best effect.

Although there are many lovely plants in our woods and swamps, there is a long list of plants from the warmer regions of the world that supply some beautiful material for a crystal garden. Also, the so-called "house plants," a single African violet plant in a glass pear, for instance, or a wax begonia, are a delight to the eye and will thrive.

A small rock garden may also be planted in a terrarium without the cover. If you desire a desert garden, small cactuses, dwarfed and gnarled branches of dry sagebrush, and any of the low-growing succulent plants may be used. Add a thin layer of sand for realism. Use a shallow container for the cactus garden, however, and, of course, there should be no cover because such a garden cannot tolerate moisture.

Plant your terrarium in the fall of the year. Keep it in a cool place, near as much light as possible but not in the sun, the moisture content constant, with sufficient ventilation and your garden will thrive.

Then when it is dull and dreary outdoors, the simple act of raising the cover of your terrarium will carry you in imagination to the dim coolness of some faraway woods such is the woodsy smell that emanates from it.

Bittersweet

By MARGARET MITCHELL BERRYMAN

Last gift of autumnal opulence,
Bittersweet berries, coral-hued!
Coveted spoil as a gay defence
Against the winter's long interlude.

Clustered berries, softly aglow,
Modest, hidden from careless eyes,
Sought by children and all who know
Loveliness in humility lies.

King Cophetua, as bards have sung,
Crowned a beggar maid as his bride:
So regal autumn jewels has hung
On the hedges of the countryside.

Sporting Proposition

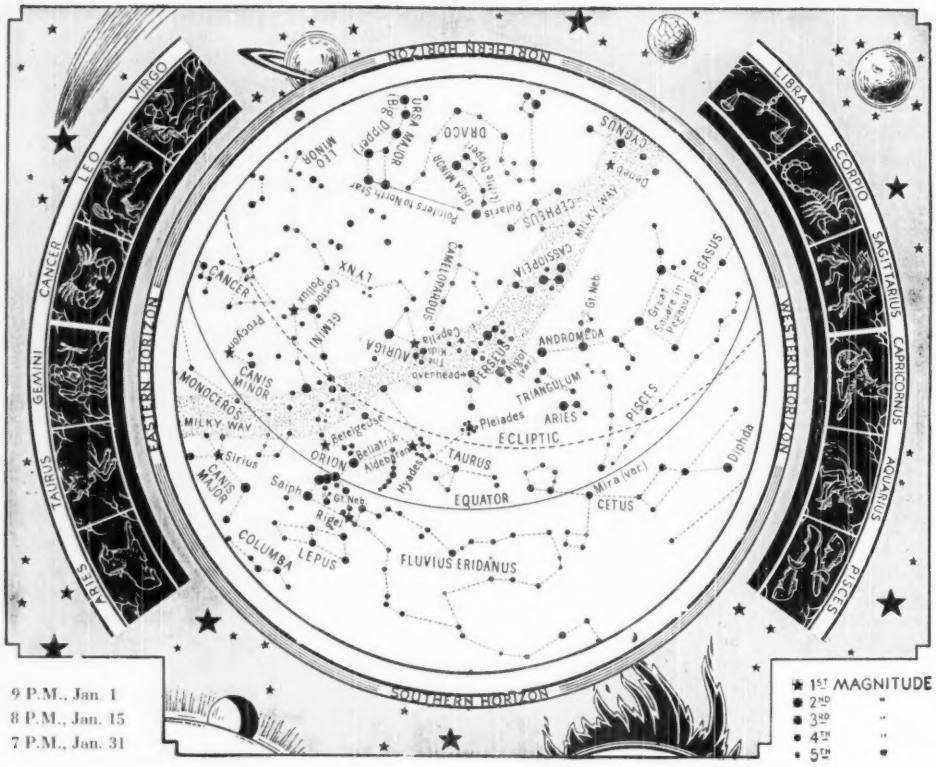
By AVERY GILES

They claim that I'm not sporting wise:
I won't shoot deer between the eyes.

Likewise, I fail to feel the thrills
Of thrusting hooks in fishes' gills.

When wild ducks silhouette the sky,
Is it such sport to watch them die?

Such so-called "sports" I view askance:
True sport provides a sporting chance!



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

The Heavens in 1950

By ISABEL M. LEWIS

In the year 1950 the great, 200-inch telescope on Palomar Mountain will undoubtedly be in action, and this should be a year of exploration and discovery in depths of space to distances of a billion light years. Stars and nebulas never seen before should be photographed with this great instrument, and minute detail never before detected in the structure of gaseous and spiral nebulas, and the star clouds of our Galaxy, should be brought into view.

It was on October 22, 1949, that the repolishing of the peripheral zone of the great mirror was completed. This was a six-months' task undertaken in the spring to remove a minute bulge around the border of the disk amounting to an infinitesimal fraction of an inch. Even before the removal of this slight defect the performance of the mirror had been superb, as shown by the intricate detail of structure, brought out in photographs taken with it, that had never been seen before in certain well-known nebulas. About three months would be required after the completion of the repolishing of the mirror for the recoating of its surface with aluminum and re-installation in the mounting from which it had been removed. It had not been necessary to remove the mirror from the mountain for the repolishing, which greatly simplified the work. There is the extremely interesting possibility that this powerful instrument will be turned on that fascinating little planet of mystery, Mars, when it draws near opposition and to its nearest approach to the earth on its present trip around the sun.

The date of Mars' opposition to the sun will be March 23, but its closest approach to the earth will occur on March 27. It will then be at a distance from us of about 60,400,000 miles. This is, however, one of

the unfavorable oppositions of Mars. The most favorable ones occur at intervals of 15 or 17 years, and then the distance of the planet from the earth is only about 35,000,000. The most favorable opposition in many years came in August, 1924, when the planet came within 34,500,000 miles of the earth. The next most favorable opposition came in 1941, and it will not be until 1958 that another very favorable approach of Mars to the earth will occur. At such favorable oppositions Mars outshines even the planet Jupiter, and its fiery red color then gives it a most striking appearance. At closest approach to the earth in 1950 Mars will be brighter than Canopus but less brilliant than Sirius. The best time to observe the planet telescopically will be in March and April, with the most favorable period, of course, around the time of opposition and nearest approach to the earth, that is, March 23-27. As the planet is close to the celestial equator in March and April of this year, crossing it from south to north on March 5, it will be equally well observable in either hemisphere.

The most favorable time to observe the planet Mercury in the evening sky is at or near the times of greatest eastern elongations, which occur in the spring. It is then that the ecliptic, near which the sun, moon, and planets are always to be found, rises most sharply from the western horizon and the distance of the planet above the horizon is greatest. In the autumn the ecliptic rises most sharply from the eastern horizon in the early morning, and, therefore, the planet is seen to the best advantage as morning star when it is at or near the greatest western elongations that occur in the fall months.

In 1950 there will be four greatest eastern elongations of Mercury, near which dates the planets may be found in the western sky in the evening twilight. These dates are January 1, April 23, August 21, and December 15. The most favorable of these will be the one that occurs on April 23. There will be three greatest western elongations, when one should most easily find the planet in the morning twilight. These dates are February 10, June 9, and October 2. Of these dates the most favorable time to look for the planet in the morning sky will be at or near the elongation of October 2. The planet can usually be seen from a week to ten days, or even two weeks, before and after the dates of its greatest elongations from the sun, the western elongations being the ones that occur when the planet is seen in the eastern sky before sunrise, and the eastern elongations the ones when the planet is seen in the west after sunset.

The planet Venus has elongations that occur much less frequently than those of Mercury because of its greater distance from the sun and much longer period of revolution. So brilliant is the planet, and so far does it depart in angular distance from the sun, that it is visible either in the western evening or eastern morning sky, except for brief periods near the dates of its inferior or superior conjunction with the sun. In 1950 Venus will be in the evening sky from January 1 to January 31, when it is in inferior conjunction with the sun. It then passes from the evening to the morning sky and will not be visible for a brief period before and after January 31. Venus will remain in the morning sky from January 31 to November 13, when it is in superior conjunction with the sun and passes again to the evening sky for the remainder of the year. Venus will be at its greatest elongation on April 11, when it will be farthest west of the sun and highest above the eastern horizon at sunrise. This planet will be seen for the greater part of the year, then, as a morning star, and will appear as an evening star only very briefly in the early part of January, low in the southwest. It will not be seen in the evening sky again until near the end of November.

Mars will be visible throughout the year. On January 1 it will be in the morning sky in the constellation of Virgo, rising before midnight. It will remain in this constellation until sometime in August, when it will pass into the constellation of Libra, and before the end of the year will have passed through Libra, Scorpio, and Sagittarius into the constellation of Capricornus, where it will be found at the end of December. On the date of opposition to the sun Mars will rise at sunset and be visible all night. For the remainder of 1950 it will continue to be visible in the evening sky.

Jupiter starts the year in the constellation of Capricornus, and is then low in the southwest at sunset. It is in conjunction with the sun on February 3, when it passes to the morning sky. On the date of opposition on August 26 it will rise at sunset and be visible all night. It will continue to be visible in the evening sky until the end of the year. Near the end of March Jupiter passes into the constellation of Aquarius, where it will be found for the remainder of the year.

Saturn will still be in the constellation of Leo at the beginning of 1950, and will remain in that constellation until it passes into the constellation of Virgo in September. There it will remain for the rest of the year. Saturn is in the morning sky in January, rising before midnight. On March 7 it will be in opposition to the sun, rising at sunset and remaining visible all night. From then on until shortly (Continued on page 50)

Two People, Planting

By DANIEL SMYTHE

They plant their tiny trees, intent
On what is more than ornament.
For some day what they plant will rise
And shake their branches to the skies;
The little shades will dare to run
Between the slivers of the sun.
And they who plant these trees will know
What long, eventful years will show—
Expanding limbs, and strengthening roots,
The bright flowers turning into fruits.
These two prepare a song of growth.
And earth will richly answer both.

Camera Trails

By EDNA HOFFMAN EVANS

NEW YEAR'S greetings, folks. May 1950 be full of health, happiness, and lots of good picture possibilities.

And, speaking of good pictures, I received a letter recently from a reader in Pennsylvania — a letter that contained three seemingly simple but extremely difficult-to-answer questions. I have answered them directly, to the best of my ability, but they seemed to me to be worth a "Camera Trails" section, too.

These are the three questions. First, what represents a good picture? Second, what kind of material should be used for pictures? Third, how and when should a picture be taken?

After asking the questions, the writer added: "I would be very grateful if you would answer these questions for me, because when I take a picture, I want it to be the best."

This discussion, then, is an expansion of the letter I wrote in answer to his questions. I hope it may prove of interest and value to other camera enthusiasts who also want their pictures to be "the best."

At first glance, the questions, are easy — until one sits down, and tries to answer them. Frankly, I have meditated on them for several weeks. My line of reasoning follows.

First: What represents a good picture? While we may not agree on individual "good" pictures, I think nearly every photographer will concede that there are certain features that all good pictures should have. In the first place, they should be sharply focused — unless, of course, the photographer is striving for a "soft" effect, and, in that case, the focus will be somewhat "fuzzy." This "soft" technique is not used as much as it once was, but it is sometimes used to soften harsh details in portraits and in landscape shots.

A good picture should be properly exposed, although here, again, choice and purpose can modify the results. The cameraman may want to emphasize one portion of his picture by overexposing it. A black figure may be silhouetted against a lighter background. For example, note the picture used here as illustration. When I took it, I had in mind (the model did not object) using it to illustrate the amateur snapshooter's tendency to try to get all outdoors into one small picture. For that purpose, I posed my friend on the rim of the Grand Canyon and over-exposed, so the foreground would go black while the miles-distant details would also be visible. I took it slow, about 1/50th, and stopped the lens down to f/11. Now, instead of using the illustration in the way I originally intended, I include it as an example of over-exposure for a definite purpose.

Generally speaking, however, "good" pictures have no areas of over- or under-exposure; they have no predominating areas of black shadow or white space, and details should be visible in the shadows. Proper exposure and skill can result in lights and shadows that are meaningful and effective.

In good pictures, motion should be stopped. There may be some rare instances where a blur of motion can be used to show great speed. However, in nine hundred and ninety-nine cases out of a thousand, motion is out of place in a "still" picture. Get a movie camera if you want motion. In good "still" pictures there should be no blurs resulting from movement, either on the part of the subject or of the camera.

All the foregoing, then, are features that are shared by good pictures. The rest is up to the individual photographer. Try as he may, he will never be able to please everybody. What one person considers "good," another may call "just so-so" or even "lousy." So far as I am concerned, a "good" picture is what the individual photographer likes and can feel proud of, regardless of what other people think.

Second question: What kind of material should be used for pictures? I assume that "material" means photographic subjects. Here, again, tastes differ. Nature photographers like natural subjects such as birds, animals, insects, flowers, scenic views and outdoor shots of all kinds. Some photographers like big areas — mountain crests, waterfalls, graceful palm clusters along a tropic shore. Others prefer to train their lenses on the relatively small area in which a mother bird feeds her hungry nestlings, or where a squirrel sits munching a tasty morsel. Still others like flowers — single blossoms or clusters; or they photograph a group of mushrooms, a meditative toad, or the graceful spiral of a snail's shell.

This picture illustrates how over-exposure can be used for a definite purpose. The foreground becomes almost a black silhouette, while the miles-distant details on the other rim of the Grand Canyon also are visible.

There are other kinds of camera hobbyists, too. Out in the middle of the northern Arizona desert last fall I met a camera fan who specializes in bridge shots. We were both interested in the horizontal, vertical, and diagonal lines to be found in a suspension bridge that spanned a deep dry wash in the Navajo country. Other photo-enthusiasts like architectural shots best, or babies, sport scenes or still life, pretty girls or sailboats. None of the above, the Nature fan included, could agree on a single "good" camera subject, yet all might take good pictures along the lines of their respective interests.

Third question: How and when should a picture be taken? I think a picture should be taken at the time when it is available, and when the photographer has the equipment on hand with which to take it. There are some pictures that can be arranged for in advance, but some of the best and most spectacular — particularly in the Nature field — just "happen." I have found, after many sad experiences with lost opportunities, that it is best to take a picture when I see and want it. It is not wise to put it off until "on the way back." I may not come back that way, or it may be dark by the time I do return. Other circumstances and considerations, too, may enter in to prevent the taking of a postponed picture.

On the other hand, I do not think it is polite to go around snapping candid pictures of people. There is such a thing as respecting the other fellow's privacy. Some picturesque characters — that bewhiskered old prospector, that fat, jolly looking New Orleans Mammy, that brown and wrinkled Indian, or that Vermont farmer — may pose for you willingly upon request. Or, if your subject wants payment, pay him, if the picture is that important to you. If permission is refused — well, anyway it was a nice idea. Remember, too, that some people object to photography. Some of the most picturesque Indians, in this country and in Mexico, Central and South America, think the camera lens is an "evil eye." They are afraid to be photographed, and they may object strenuously if you point a camera in their direction.

In taking bird and mammal pictures, I do not think it is fair to endanger the life or safety of the subject, just for the sake of a photograph. A mother bird should not be kept from her eggs too long, and newly hatched babies should not (Continued on page 47)

be exposed to the hot rays of the sun for lengthy periods. Protecting branches or supports should not be cut away from nests, nor should the young, be they bird or mammal, be removed from parental care and then abandoned. Wild animals, confined for the sake of photography, should not be left without proper food and water, nor should they be held captive too long.

Again, in plant pictures, I do not think it is good sportsmanship to uproot a plant, tear off a rare flower — or even a not-so-rare one — just for the sake of a photograph. A Nature photographer can carry much of the outdoors away with him — yet the true Nature-loving photographer also leaves Nature undisturbed.

Thus, to sum it all up, I think a good picture is one that pleases the individual photographer who takes it. Its subject matter appeals to him, and he takes it where and when he finds it. Such a picture tells him a story, or recalls some pleasant event or scene to his mind. It is clear, properly focused, and contains no unnatural arrangement or distortion. Not everyone will like the same picture, but that is only to be expected. A photographer who sets his own personal standards high, and who strives to attain them both in subject matter and in technique, is bound to take good pictures.

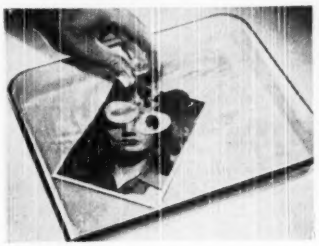
Dipping solutions for flash bulbs are designed to help achieve proper color balance in transparencies.

ODDS AND ENDS

And now for miscellaneous items, some of which arrived too late for inclusion in the Christmas section, and all of which still may be of interest.

The FR Corporation has offered for sale a Snapshot Printing Kit, designed to permit the printing of pictures in a lighted room. It contains an aluminum printframe, three printrays, one printong, a bottle of paper developer, a bottle of fixol, a 25-sheet package of 2¾ x 4½ inch paper, and an instruction book. Of course, the kit will not turn out salon enlargements, but it would be a nice gift for the youngster (or oldster) who is a photo-enthusiast but who has no darkroom facilities available. The kit sells for $3.95.

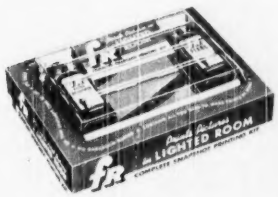
And for the fan who does have an enlarger and darkroom, but who has difficulty in turning out prints of a definite tone, Arpin Products, Inc., 422 Alden Street, Orange, N. J., have devised a simple gadget called the Agi-tone Comparator that has three uses in the developing tray. It is shaped like a four-leaf clover and each leaf is a plastic color guide so that, by matching the tone he



The Agi-tone Comparator serves as an agitator, measures print tone, and indicates when developer solution is too old.

wants with the increasing tone of his print in the developer, the darkroom operator knows when to take his picture out of the "soup." The gadget also serves as an agitator for stirring prints in the developer solution. Its plastic handle is the color of used developer that should be discarded, and when handle matches developer, it is time to mix a new batch. The gadget sells for $1.50.

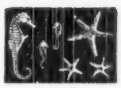
For flash bulb users who wish proper balance in their color transparencies, Alkon Photo Products, Inc., 230 East 124th Street, New York 35, have a pair of solutions, Alkote blue and Alkote amber, into



The FR Snapshot Printing Kit permits picture printing sans darkroom.

which flash bulbs may be dipped. The blue is for use with daylight type films, while the amber is for tungsten type color films. One bottle full will coat 400 bulbs.

If you are planning a trip that will take you outside the bounds of the U.S.A., be sure to get Eastman's new free booklet, "Notes for the Photo Traveler." The booklet covers such subjects as how to prepare, photographically speaking, for such a trip, how to care for your equipment under new and different conditions, customs regulations, exposure, what to photograph, and it also lists suggested photographic headquarters and processing stations all over the world. It is a mighty interesting little booklet, particularly if you have a yen to travel. Eastman's sales service division, Rochester 4, N. Y., will be glad to send it to you.



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The School Page

By E. LAURENCE PALMER

Professor of Nature and Science Education, Cornell University, and Director of Nature Education, the American Nature Association

THINGS TO DO WITH WOOD IN SCHOOL

ELSEWHERE in this magazine, we give you some pictures and tables telling about some common kinds of woods. Some may not be able to understand the tables; others may not be able to see what the pictures try to show. In spite of this, there are things you can do that will help you to learn about wood, and now and then this knowledge may be of importance to you.

Here are a few things almost everyone does with wood. We build fires, make sticks on which to roast wienies, build temporary bridges over brooks and wet places. We try to drive nails into wood, to split it, shave it and cure it. We use it for things that require stiffness, and for other purposes that require great elasticity. In short, we find a great variety of uses for wood. We should know that while some woods are good for some of these things, others are better for others. Sometimes, we want a wood that is heavy and at other times one that is light. Sometime, we need a soft wood and at other times we want one that is hard. We even seek beauty in woods when we have certain uses in mind. Let us suggest a few things to do that will help you learn about a few of these things for yourself.

Take a small square stick of wood, maybe an inch long and a half-inch on either side. Split it lengthwise and diagonally so that you have two three-sided pieces. Put these pieces in a small vise so that the angle of one is pushed against the angle of the other. Screw up the vise and see that each piece indents the other about equally. This is because they are, of course, of equal hardness. Now make sample sticks, of similar size, of as many other kinds of wood as are available. Test them with the vise to see which will dent the other, and then arrange your sticks in the order of their hardness, as shown by your own experiments. Now, at least, you know which of the woods you have for study are the hardest, and, better yet, you know how to find out which of two woods are harder.

You may wish to test different woods for their stiffness. Cut a few pencil-sized sticks of different kinds of wood. Fasten one of these erect by the end in the jaws of your vise. Hook the free end into the hook of a spring balance. See how much of a pull it requires to bend the stick an inch out of line; two inches; how much to break it. Test your other sticks in this way and make a list to show how you think your woods vary in stiffness.

It is important to know whether woods swell or contract when they get dry, or become water-soaked. Bore a row of holes in a few different kinds of boards, some of which are green, some well seasoned, some just ordinarily dry. Cut a variety of pegs just large enough to fit nicely into the holes you have bored. Soak one board, put one in a hot oven, and put one away where it will not be disturbed for some time. After a few days or weeks note if the pegs fit more loosely or more firmly in the holes than they did when you first set them there. Which of your woods do you think are most likely to shrink in seasoning? Which might show undesirable changes if they were to be exposed to alternate soaking and drying? Make lists of conditions under which you might or might not use some of the woods you happen to have available.

It may or may not be academic to know how woods shrink or expand. We have two chairs in our home. One was made of seasoned maple by one of the biggest furniture manufacturers in the country. The other was made of hickory trash by an old carpenter back in the hills. Every winter when our house is heated the maple chair made by the furniture house gradually falls to pieces. The hickory chair is as solid at one time as at another. The back country chair maker knew that green hickory shrinks greatly in seasoning. Knowing this, he made the chair legs of green hickory and the connecting rungs of seasoned hickory. As the green hickory legs shrunk they closed on the dry seasoned rungs with a grip that cannot be equalled by the best of glues. Similarly, early carpenters and shipbuilders used wooden pegs to tie timbers together without nails.

Cut a bunch of match-sized sticks of different kinds of woods. Mark them so that they may be identified easily. Place them on a piece of wire gauze so that they are arranged like the spokes of a wheel, with a space in the center free enough to permit some sort of flame you have available to go between the stick ends without actually touching them. Hold the flame up, through and between the ends of your stick spokes and notice if they all catch fire at the same time. Put them aside in the order in which they caught fire. Reverse the ends of the sticks and try your experiment again. Did they again catch fire in approximately the same order? How would you think your woods would vary in their kindling properties? Repeat this experiment enough times so that you feel reasonably sure that a given kind of wood is likely to catch fire more quickly than another.

Take a number of small slabs of different kinds of woods and lay them on a table. Apply paint equally to all of the slabs. Leave the slabs for a time and then subject them to some reasonable wear and tear. Does the paint stick equally to all kinds of wood you have available for study?

It might be easy for you to go ahead and learn many more things all on your own. You might find, however, that it was easier to use experiments others may have carried on. If this is the case look at the figures given in the tables on pages 26 to 31. Take an item like stiffness, and, using the figures in the tables, set the woods down in order, from the stiffest to the least stiff. Does the order given by these tables check with what you found by your own experiments? If not it might pay you to check your own findings, but I do not think you should accept what the tables tell you in spite of what you found for yourself.

Having used the tables to help you check on your own findings, so far as stiffness is concerned, use them again to check on such matters as hardness, weight, paint-holding qualities, nail-holding ability, and so on. Having used the tables and your experiments, make your own report as to how you think the woods available for your use should be put to work. Do not forget to test your woods for their ability to withstand exposure to the weather, their ability to withstand blows, their ability to resist decay and the attacks of insects. Also do not overlook the properties your woods may have that may be pleasing to people under certain circumstances. Smell of some wet red cedar and some wet hemlock to see which you feel you would like to have used for lining a clothes closet. Taste some red cedar and some white pine to decide which you would prefer to have in a lead pencil. Look at the grain or color in some black cherry, and in some chestnut, to help you decide which of the two you would prefer to use for a fine piece of furniture.

We use woods for many things in our recreational activities. We wish to build fires that will have good cooking coals, to make fences that will not have to be replaced, to make bridges that will not break, to make splints to use in baskets, to get boards to make into skis. All of these features are considered in our notes in the insert.

Start a hobby of identifying woods and of making large collections of different kinds. It will surprise you how much fun you may have at it. Build a small library, starting with the references given in the feature article, so that some time you will have more help than you now do to understand and use wisely the wood that is about you. Of one thing I am certain. If you learn to know and to appreciate wood better you will use it more wisely, and will, I am sure, improve as a conservationist.

Ibis Rookery Found

From the wild hinterlands of Venezuela word comes to the National Geographic Society of the discovery of a *garcero*, or rookery, of the rare and spectacular scarlet ibis. Dr. Paul A. Zahl, New York ornithologist, reports that the area in which the birds are concentrated is about half a mile long and a quarter-mile wide. He estimates that about five thousand birds are in the rookery, and says that the foliage of the trees appears "as though it were laden densely with blood-red fruit." The rookery lies about 125 miles west of the expedition headquarters, which is in Apure State, south of the Venezuelan capital of Caracas.

Bill Vogt Resigns

William Vogt has resigned from his post as chief of the conservation section of the Pan-American Union and will devote his time to writing and lecturing on the conservation issues of the day as he sees them. A life-long conservationist, with many quiet achievements to his credit, Bill soared to international fame with the publication of his book *Road to Survival*. His post with the Union did not afford him the time needed to produce, unfettered, articles on conservation subjects, and, perhaps, another book.

Wild Bird Songs

Jerry and Norma Stillwell are active and enthusiastic Texas conservationists and naturalists. As a hobby they have been recording the songs of birds in the South and their home State, not as a commercial project but, as Jerry writes, as "a captivating hobby for graying heads." In the process they have built up quite a library of records of their own making, sharing them with others when they have funds to defray the cost of reproduction. Anyone interested in these records, and the details about what is to be heard from them, need only drop a line to the Stillwells at P.O. Box 5742, Dallas, Texas.

"Rediscovered" Artist

In 1879 the widow of Andrew Jackson Grayson presented to the University of California a series of 154 colored paintings of the birds of California and Mexico. They were deposited in the Bancroft Library at the University and virtually forgotten. Since an article published in 1891 in a scientific journal, little attention appears to have been paid to Grayson. Recently Harry Harris, Pasadena ornithologist, came across the paintings and called them to the attention of W. Lee Chambers of the Cooper Ornithological Club. Mr. Chambers' daughter, Lois Chambers Taylor, visited the collection and obtained permission to reproduce some of the plates in *The Condor*, official publication of the Cooper Club. These were financed by contributions from individuals, and the publication of them in color has focused attention on the outstanding bird artistry of Grayson. This "rediscovery" has resulted in an exhibition of some of the originals at the Los Angeles County Museum in connection with California's Centennial. The Cooper Club hopes that eventually means may be found to bring out the complete set, and thus, tardily, to achieve for the artist the fame due him.

Gabe Honored

Dr. Ira N. Gabrielson, noted naturalist, former Chief of the U. S. Fish and Wildlife Service, and presently president of the American Wildlife Institute, has been awarded the Audubon Medal for distinguished service to conservation of natural resources. The award was made by Dr. Ludlow Griscom at the annual dinner of the National Audubon Society. The only previous recipient of the medal has been Hugh Hammond Bennett, Chief of the U. S. Soil Conservation Service.

Burpee Blooms

Word comes from W. Atlee Burpee Company of Philadelphia of the introduction for 1950 of two new zinnias, two new marigolds and a new sweet pea. The zinnias are Tangerine, a bright, lively orange with a reddish-orange tinge, and Floradale Scarlet, a vibrant scarlet-red flower. Sun Giant is the name of the large-flowered new marigold with blooms to four and one-half inches across, while the new, dwarf, single, French marigold, with bright yellow flowers, is christened Sunny. The newcomer among the sweet peas is called Serenade, which has large blooms that are a soft salmon-fawn on cream ground, slightly tinted with delft rose.

Feeding Birds

Ingenuity is certainly rampant in the catalog recently received from Hyde Bird Feeder Company, 56 Felton Street, Waltham 54, Massachusetts. The folks at Hyde's will be happy to send *Nature Magazine* readers a copy.

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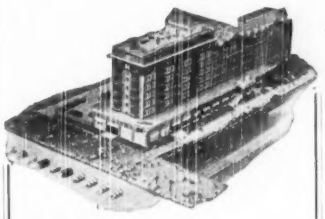

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WILDLIFE PARKS OF EAST AFRICA

(Continued from page 37)

serves, Kenya has two small historical parks, at Gedi on the coast and at Olorgesaille in the Rift Valley. Two more parks will be proclaimed in the near future — a 300-square-mile Mount Kenya National Park, to include all of that beautiful mountain above 11,000 feet, which means above timberline, and the Aberdare National Park, which will be more a playground than an animal sanctuary.

Mount Kenya will not be much of a refuge, either, although buffaloes, leopards and elephants sometimes get up to 15,000 feet. There are an estimated 1500 elephants on the mountain between migrations, but they usually stay in the bamboo forests below timberline. Kenya Colony maintains a sanctuary for the magnificent sable antelope near the coast on the Tanganyika border, and also has set aside the Trans-Mara, the only remaining pristine sanctuary in the colony and habitat of the roan antelope. It is near the Serengetti plains of Tanganyika, probably the most valuable faunal area in the world.

Tanganyika has done little toward wildlife preservation. It has the loosest game laws in British Africa, the poorest administration, the most persistent and successful native poachers, and probably the largest yearly slaughter of animals. Tanganyika proclaimed 5500 square miles of the Serengetti as a national park in 1940, but never defined the boundaries, or appropriated money or appointed a staff to run it. About 8000 Masai and 150,000 head of their cattle run through the area, which is on a great migration route used by hundreds of thousands of wild animals making for the Doma plains. The park probably will be re-proclaimed, but with a smaller area, and there is a good chance that the migration route — the only part of the Serengetti worth preserving — will be omitted, making it a sanctuary in name only, like Tanganyika's 29,000 square miles of game "reserves." These areas, never patrolled adequately and in some cases not patrolled at all, are worthless as refuges. They are happy hunting grounds for poachers.

Uganda has no parks and no immediate intention of creating any. It has four wildlife reserves, over which sharp control is exercised. The protectorate's game officers approach their control duties with considerable enthusiasm. "Control" means the control of animals, rather than of hunters; from 1940-46 an average of 1035 elephants were killed in Uganda yearly as a "control" measure. In many parts of Africa one hears criticism of the Uganda Game Department's tendency to confuse "control" with "slaughter," but the agency, in an official pamphlet, recently announced happily that "after 24 years of heavy shooting there are appreciably fewer elephants in the protectorate, a fact which is welcome rather than otherwise. There are still more than enough without any doubt."

Ethiopia has a few scattered game reserves — reserves to be hunted over only by the Emperor or the nobility. Several game reserves have been proclaimed in the Sudan, without making much impression on the officials there. In conversation with a provincial governor I mentioned that I would like to visit a wildlife sanctuary in his area. I told him where it was, and he said, "Oh, is that a reserve? I hadn't known it." It had been one for a dozen years.

Many wildlife specialists, naturalists and hunters, lament the lack of interest in game preservation among some high government officials who, as one authority put it, "would rather go fishing than take care of their trust."

A respected conservation enthusiast in Kenya complained bitterly to me of what he called a too-common attitude today to regard all wild animals as vermin.

"The worst enemy of the wildlife is the government, through its 'control' officers," he said. "At Makuni, for instance, which 35 years ago when I first came out was a hunting paradise, some 1200 rhinos were shot recently to clear land for grazing. The shooters claimed they found that many rhinos on the 400,000 acres cleared. Actually they used the need for grazing as an excuse and went north, south, east and west hunting rhino. It was a deplorable slaughter. When I was District Commissioner I allowed just two elephants to be shot in 18 months to protect native property. After I left the new DC allowed about 200 to be shot in six months. You can tell in a week or two whether a new DC is interested in game preservation Too often they are not."

With all the slaughter and shooting, elephants, lions, leopards and perhaps buffalo seem to be maintaining their numbers in Kenya, although exact statistics are lacking. In Tanganyika no wildlife is holding its own. In Uganda, elephants and buffaloes are losing, the latter because they have been picked for slaughter in two areas as a tsetse control measure. In the Sudan buffaloes and elephants are perhaps holding on, but few other species are, except the white rhino, which, under strict protection, may be increasing. Northern Rhodesia has a strong, enlightened wildlife department, but from there on southwards, the situation gets progressively worse until one meets the farmers' wild-animals-are-vermin complex in the Union. It is an attitude that permits few undomesticated creatures to survive. Altogether it is not an encouraging picture.

THE HEAVENS IN 1950

(Continued from page 45)

before September 15, when it comes into conjunction with the sun, it may be seen in the evening sky. On that date Saturn returns to the morning sky where it will be seen for the rest of the year in the constellation of Virgo.

Uranus, which is at the limit of visibility without telescopic aid at the time of its opposition on December 29, will be in the constellation of Gemini, not far from the boundary between this constellation and Taurus throughout the year. It will be in conjunction with the sun on June 27.

Neptune, which is always a telescopic object, is a little less than 8th magnitude in brightness at the date of its opposition to the sun, April 6. It is in Virgo, a few degrees northwest of Spica, and its position does not change as much as 5 degrees during the entire year. Its distance from the earth varies, during the year 1950, from about 29 to 31 times the distance of the earth from the sun.

Pluto, appearing only as a faint, star-like object in large telescopes, is now in constellation of Leo, near the bright star of third magnitude, Epsilon Leonis, at the end of The Sickle. Its average distance from the earth in 1950 is about 36 times earth's distance from the sun.

In the year 1950 there will be four eclipses, two of the sun and two of the moon. On March 18 there will be an annular eclipse of the sun. This will be visible as a partial eclipse over southern Africa, the extreme southern part of South America, the South Atlantic Ocean and part of Antarctica. An odd feature of this eclipse is the fact that part of the path of the annulus is on the earth and part of it off the earth, the central line passing a few miles south of the earth. There will be a total eclipse of the moon on April 2, visible generally in Europe, Asia, Africa, Australia, Antarctica, and central and eastern South America.

There will be a total eclipse of the sun, September 11-12. The path of total eclipse will pass over the extreme northeastern part of Siberia and the Near Islands in the Aleutians. Partial phases will be visible in northeastern Asia, Japan and Alaska.

A total eclipse of the moon will occur on September 25-26. This will be visible in North America, South America, the Arctic and Antarctic regions, Africa, and the greater part of Europe.

In 1950 sunspots should occur in decreasing numbers. The sunspot maximum peak was reached in August, 1947, and since then there has been a gradual decrease in the number observed, although exceptionally great sunspot groups may occur at any time.

Fresh Water Fishes

North American Fresh Water Sport Fish. By Lou S. Caine. New York. 1949. A. S. Barnes and Company. 212 pages. Illustrated. $5.00.

This is a guide to the fishes covered by the comprehensive title, their description and habits, and tackle and methods of their capture. It appears an important volume for the library of any fisherman.

Dogs of the World

To the best of our knowledge we have never seen a Puli, a Kuvasz, a Komondor, a Kelpie or Dandie Dinmont, but they are all dogs, we discover from the World Dog Map just come to hand from Judy Publishing Company, 3323 Michigan Boulevard, Chicago 16, Illinois. On this map are pictured the various canine breeds by countries, around a numbered world map, the numbers corresponding with each dog shown. This is an interesting composite dog story. It sells for one dollar.

Gadgets

It strikes us that it is about time someone thought up the Gates Lantern Lighter, which is manufactured by the Gates Sales Co., 4728 Lorain Avenue, Cleveland 2, Ohio. It is a windproof and rainproof lighter that can be attached easily to any gasoline or acetylene lantern. Sells for a dollar. . . Cleveland seems to be a spot where people come up with good ideas, for we have received information from The Tesco Corporation, 628 Engineers Building, Cleveland 13, Ohio, about their "Keep 'Em" Minnow Bucket, which keeps bait alive for weeks without gadgets. Sells for $5.95.

Hair Exhibit

Now on tour is a traveling exhibit developed by the Cranbrook Institute of Science, Bloomfield Hills, Michigan, and called "Stories in Hair and Fur." It treats with many aspects of animal hair — biological, historical and commercial. The exhibit represents a spread of 3500 years in time covered, the oldest garment being from the 19th Egyptian dynasty and the newest a chinchilla coat. The show was planned and organized by the director of the Institute, Robert T. Hatt, and executed under the direction of James H. Carmel. We do not know the itinerary, but the exhibit will be shown at various museums, opening first at the Carnegie Museum in Pittsburgh.

Park Visitors

The number of visitors to the national parks and other areas administered by the National Park Service broke all records for the year running from October 1, 1948, to September 30, 1949. Figures showed 31,364,180 visitors, with the Great Smoky Mountains National Park leading all the rest with 1,510,636. Four other parks recording more than a million visitors were Rocky Mountain, Yellowstone, Platt and Shenandoah.

Cornell Leaflet

"The Elementary Science Library" is the title of the autumn Teacher's Number of the Cornell Rural School Leaflet, Volume 43, Number 1., and it is, as usual, a most valuable publication. It is the work of Dr. Eva L. Gordon and represents an almost unbelievably gargantuan task of sampling, evaluating and reviewing of books valuable in such a library. About two hundred books, published between 1938 and 1949, are listed in this leaflet, with brief comment. These leaflets are available to teachers in New York State on application, and to others at a subscription price of fifty cents a year for four leaflets.

Rockland Trails

Latest publication of the live-wire Rockland Audubon Society, West Nyack, New York, is a booklet entitled "Trails and Pleasant Walks in Rockland County, New York." Its first purpose is "to encourage, in a motor age, the old art of walking." Certainly the interesting opportunities for such walking outlined in this pamphlet of 28 pages, and supplemented by a map, should accomplish the stated purpose. Copies are available for fifty cents.

Lovely Nature Books

Animal Babies. By Margaret Jean Bauer. Chicago. 1949. M. A. Donahue and Company. 88 pages. Illustrated with 12 full pages in color and 58 marginal drawings by Jacob Bates Abbott. $2.00.

Friendly Animals. By Karl Patterson Schmidt. Chicago. 1947. M. A. Donahue and Company. 64 pages. Illustrated in color by Percy Reeves. $2.00.

Birds at Home. By Marguerite Henry. Chicago. 1942. M. A. Donahue and Company. 88 pages. Illustrated in color and black and white by Jacob Bates Abbott. $2.00.

Homes and Habits of Wild Animals. By Karl Patterson Schmidt. Chicago. 1934. 64 pages. Illustrated in color and black and white by Walter A. Weber. $2.00.

Traveling with the Birds. By Rudyerd Boulton. Chicago. 1933. M. A. Donahue and Company. 64 pages. Illustrated in color by Walter A. Weber. $2.00.

Picture Sets: "Traveling with the Birds" by Walter A. Weber; "Wild Animals" by Walter A. Weber; "Domestic Animals" by Percy Reeves; "Birds at Home" by Jacob Bates Abbott; "Animal Babies" by Jacob Bates Abbott. Twelve pictures, 10 by 12, in each set and in full color. $1.00 per set.

Although the above listed publications have, except for *Animal Babies*, been available for varying periods of time, none had been sent to us for review. Then, one day, the artist, Jacob Bates Abbott, dropped in for a visit, and showed us the twelve pictures in the "Animal Babies" set. They were both lovely and full of appeal, and we inquired further to discover that they were also a part of the book. And, too, we discovered the existence of the above companion books and the sets of separate pictures. Why the publishers, until jogged by Mr. Abbott, failed to call this material to the attention to the magazine with the largest distribution among people interested in Nature we shall never know. So, tardily, we list the above books and pictures with our hearty recommendation.

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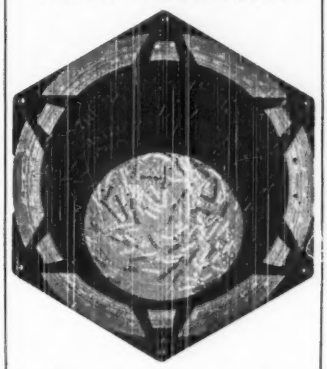

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BIG BEND

(Continued from page 15)

ters, the desert is bright from March to June with the flowers of mesquite, catclaw, lupine, pentstemon, with hedgehog, button and other cactuses, prickly pears, yuccas, lechuguilla, ocotillo, and a host of others.

"You are wounded, caught, held or anchored by this spiteful vegetation at every step of the way," wrote an early, weary explorer. It is true. You are needled and stabbed. Yet this "spiteful" vegetation provides food, drink and many other commodities for both man and beast. Sweet food, alcohol, intoxicating beverages, medicines, wax, candles, shoe polish and soap are among the products of the many agaves — commonly called mescal and century plants — the yuccas, sotol and lechuguilla.

The ruins of crude candilla factories can still be found in Big Bend. This plant has been used in enormous quantities to manufacture candles, shoe polish, floor wax, phonograph records and many other products. During the first World War, it was gathered for waterproofing munitions. For years before penicillin, it was used for treatment of venereal diseases. This use is indicated by the plant's scientific name, *Euphorbia antisyphilitica*. Although the plant has been plundered in the United States until it has become unprofitably scarce, some small Mexican wax makers still steal across the border to raid what is left. The park rangers have had to confiscate strings of up to fifty pack animals used for this purpose.

What other interesting things are there to see and do in Big Bend National Park?

You can always bathe in the hot springs. They offer "treatment for hiccups, asthma, boils, stomach trouble, dropsy, kidney trouble, jaundice, pellagra, rheumatism, genitoury diseases and sunburn," according to newspaper advertisements B. P. S. (Before Park Service.) All this for twenty-five cents!

There are also pack trips and hiking trips to the Mexican mountains, to the old mission at San Vincente, other Mexican settlements, a ghost town or two, Indian graves, mescal pits, metates at Muskhog Spring, and bat caves.

What are the living accommodations in Big Bend National Park?

A mile high in the Chisos Mountains is the Basin. It is surrounded by a wall of mountains that tower two thousand feet above. In this giant stadium is the administration area. At the present there are twenty-seven cottages here, with and without bath. There is a campground, the "Chuck Wagon" that serves excellent food, and a service station. Down on the Rio Grande, at Hot Springs, groceries, meals, a cottage or free camping space can be secured from Mrs. Smith, along with the hot springs.

A primitive park, the roads, trails and accomodations at Big Bend are fairly "rugged." Road improvements and a few spur roads are planned, but they are to be kept to a minimum. A few hiking and horseback trails are available, as well as saddle horses. More cottages will be built. Eventually a lodge or two will be operated.

Most of the eleven hundred square miles of Big Bend National Park is to be kept as it was when the Spanish explorers found it. As a wilderness it offers the treasures of a hundred million years. The amazing story of prehistoric rocks. The rough wild beauty of mountains tilted and turned upside down. A world of thrilling contrasts, far removed from congested traffic and Coney Islands. Fossil animals and moving wildlife. Petrified trees and living forests. Thrilling heights and appalling depths. With careful administration, most of the primeval grandeur and beauty can be enjoyed, unmarred by civilization.

FATHER OF AMERICAN HERPETOLOGY

(Continued from page 20)

Building" in Philadelphia. Taking advantage of this loss to better his work, he commissioned new drawings of all the fishes, at great expense, to the best scientific artists of the day. He later explained the delay in publication and asked for the return of former issues, which would be replaced with new books.

Soon after the printing of this work, the Civil War, in which South Carolina took so prominent a part, began. As with all other eminent men, Holbrook's medical knowledge was utilized by his selection as head of the examining board of surgeons in South Carolina."

In 1863 his wife died. He was left childless and alone. When the Union Army occupied Charleston, the medical college in which he preserved his collections was converted into a hospital. His specimens were wantonly thrown away or seized for what they were supposed to be worth; his books were stolen, and finally his drawings and manuscripts were lost or destroyed.

"An old man now, bereft of most of his fortune, discouraged by adversities, and recognizing that a new order of scientific procedure had begun, he reluctantly ceased to even plan for his work," commented Theodore Gill. "He continued, however, to go in summer to New England, where he spent his happy youth, and in the early fall of 1871, stricken by apoplexy, saw the end of life, at his sister's residence in Norfolk, Massachusetts, breathing his last amidst kind and devoted relatives."

The memory of Holbrook has been recalled, in the manner customary to naturalists, in connection with the scientific names of various reptiles, amphibians and fishes, by a number of eminent zoologists. The genus *Holbrookia*, the earless sand lizards, was named after him. The eastern spadefoot toad, *Scaphiopus holbrookii holbrookii*, and the speckled king snake, *Lampropeltis getulus holbrooki*, also honor him. In addition, ichthyologists have perpetuated his name with the following species: Holbrook's cusk eel, *Ophidion holbrooki*, Holbrook's top minnow, *Gambusia holbrooki*, yellow bream, *Eupomotis holbrookii*, and Holbrook's sargo, *Diplodus holbrookii*.

Holbrook described 20 species and subspecies, among them the mole salamander, American toad, Eastern narrow-mouthed frog, mole, indigo and Dekay's snakes, Pacific rattlesnake, and Blanding's and Mobile turtles.

When Professor Louis Agassiz, the Swiss-American zoologist and teacher of Harvard University, eulogized Holbrook after his death, he bestowed the most significant honor. He acknowledged the herpetologist's efforts toward cementing scientific ties between Europe and America as the most impressionable contribution of the time.

Immeasurable are the hours Holbrook spent gratuitously. Immeasurable indeed, the influence he had upon the field of herpetology and ichthyology in the United States. One thing sure, his role as father of American herpetology is unquestioned.

Waterfowl Illustrated

The Saga of the Waterfowl. By Martin Bovey. Washington, D. C. 1949. The Wildlife Management Institute. 142 pages. Illustrated with photographs by the author, and others. $5.00.

This is a beautiful and dramatic book — beautiful because of its splendid pictures; dramatic because of these, too, plus the brief, pointed text that accompanies them. It is not only the story of waterfowl and what, as the author says in his foreword, "our forefathers have done and we ourselves are doing to bring about the end of American waterfowling," but it is also a powerful conservation document. It is presented, of course, with the interests of hunters in mind, and our first concern is the continued existence of migratory waterfowl as a part of our wildlife. Nevertheless, Mr. Bovey strikes out in succinct and careful text at the practices that have brought the hunting of wildfowl almost to an end; both the practices of those who shoot and of those who despoil our watersheds, our wildlife habitat and otherwise rape our land. This is a fine book and a sad commentary upon mankind.

Garden Pilgrimage

Friday, April 28, 1950, has been chosen as the opening date of the Thirteenth Annual Maryland House and Garden Pilgrimage. More than 200 noted homes and gardens will be open to the public during the ensuing ten days. Full information about this event may be obtained from The Federated Garden Clubs of Maryland, 217, Sheraton-Belvedere Hotel, Baltimore 1, Maryland.

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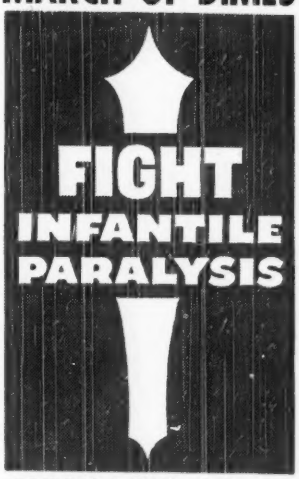

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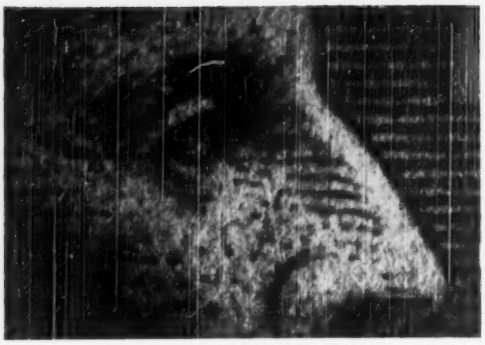

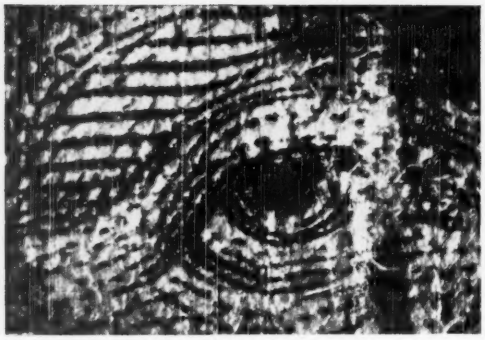

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Right eye of Washington on 1c stamp, 30X.

Right eye of Washington on U. S. dollar bill, 30X.

Under the Microscope

By JULIAN D. CORRINGTON

LET'S LOOK AT MONEY

LOOKING at money is a pastime that many of us enjoy hugely whenever we have the opportunity. Doubtless the bank teller sickens over seeing nothing but the filthy stuff, day after day; the prover in the Bureau of Engraving and Printing may regard the sheet of new bills as a work of art. But to most of us the "long green" means just so many beers, bagatelles, or Buicks — the great medium of exchange by which we translate our labors into gratification of desires, and we labor mightily to get it.

In order that the author of this present dissertation on lucre may acquire a bit more of this folding cabbage, suppose we divert our attention for the moment from the crass utilitarian aspect of mazuma, and essay a scientific approach — exploring the microscopy of a buck (or we could study a little doe if you'd prefer.)

One of our illustrations shows a small portion of a United States silver certificate, which states that "there is on deposit in the Treasury of The United States of America one dollar in silver payable to the bearer on demand." This dollar bill features the portrait of Washington, and our magnified view reveals the unglamorous means by which the engraver has depicted our first president's right eye.

If the HC of L and taxes have left you with such an article, get out a dollar bill, the fresher the better, and examine it critically, using a magnifying glass or hand lens, if available, or the reversed eyepiece of a compound microscope. You are looking at a real work of art, and will soon become aware of many fine details you have never noticed before. Observe, for instance, that of the words just quoted, the first half, above the portrait, are black on white, but that the remainder, below the picture, are white on black. We shall return to this distinction later. "Washington, D. C." is an *overprint*, covering a seal, which is of a different color; the portrait occupies a *window*, as do the two prominent designs on the back. Incidentally, we wonder how many good Americans can translate the Latin motto appearing on the reverse of the great seal of the United States?

That paper money is printed is well known — but what sort of reproduction is used? There are many possibilities, such as wood cut, line engraving, etching, dry point, stipple, mezzotint, aquatint, lithograph, or photo-engraving, photolithograph, photogravure, and rotogravure. Wood engraving, the oldest form of the art of preparing an illustration for reproduction, is a relief process; that is, the parts of the wood block that are to be inked and that will print an impression are left at the original level, while the surrounding areas are cut away. In line engraving, by contrast, lines are cut into a metal plate, filled with ink, and it is these depressions that print. The process is one of many forms of *intaglio*, an Italian word meaning to cut or carve in, precisely the etymology of the English *engrave*. For many people, a more familiar example of an intaglio would be a seal or signet ring, the design cut in reverse so that when impressed in wax, a raised or relief reproduction is obtained. An intaglio may be thought of as a negative, a relief as a positive engraving.

The word *engraving* may refer to (a, verb) the process of preparing a relief or intaglio design on a surface as a form of decorative art or for purposes of reproduction by printing, (b, noun) the block or plate so prepared, or (c, noun) the print obtained by the use of such a block. The same distinctions apply to similar words in this field, as etching. Engravings of various sorts are not necessarily commercial products for reproduction of illustrations, although that is the purpose of all but a few; the exceptions have formed a medium of original expression, used by many great artists, beginning in the Fifteenth Century.

Wood cuts were made at first with any sort of knife, later with special tools collectively known as *gravers*. Line engravings are cut with a *burin*, a chisel-like tool of tempered steel, triangular or quadrangular in section. It is pushed forward, gouging out a small shaving and leaving a fine *burr* (roughness) along the edges. A *scraper* is then employed to remove the burr. In using the burin one cannot stop suddenly and lift the tool so as to form a thick line with a square end, as this would leave the shaving attached to the block. Hence lines incised by this method taper at both ends, becoming thinner and shallower where the burin enters or escapes from the metal surface. A dry-point engraving is similar but is scratched with a needle, pulled toward the operator, leaving a pronounced burr which is not removed, since it yields a desired blurred, rich effect. The designation refers to the fact that etching fluids are not used. This process has been popular, either alone or in combination with such other methods as line work and etching, ever since the days of Rembrandt.

Etching employs chemical means to remove metal; "biting" it, as the etchers say. A metal plate of zinc (coarse), copper (fine), or steel (finest) is coated with a *resist* or *ground*, of various waxes and resins. This ground is scratched away with the etching needle, a phonograph needle mounted in a handle being one of the favored tools. After the design has thus been reproduced, any of a number of chemicals, as nitric acid or perchloride of iron, is applied to eat the metal where not protected by the ground. The process is not as simple as this bare outline suggests, there being many niceties, variations, and complications.

Lithography is an allied art, originally employing very fine-grained and perfectly smooth and flat limestone slabs, chiefly

obtained from a single formation in Solenhofen, Germany, famous also as a site of finds of spectacular fossils. More lately, zinc or aluminum plates have been substituted for the stone, and photolithography, one of the many photographic means of reproduction, is a major method today. Lithography depends on the fact that oil and water will not mix, so the design is prepered on the stone with greasy inks. The rest of the surface is wet with water, preventing the inks from adhering to any part not included in the design. Strictly speaking, lithography is not engraving, since the design is not cut into anything, either as relief or intaglio; rather it is a surface print. As a means of reproducing material, however, the lithographic methods are included with the others in any classification or discussion. In modern offset lithography the design is photographed on a thin zinc plate, an impression is made from this on a rubber blanket, and from the blanket on paper.

Photographic methods include the halftone process, photographing the material through a screen on, for example, a copper plate. A picture reproduced by this means is seen to be made up of fine squares of various shades of light and dark, the screen being visible under low magnification. These halftone screens are very precisely made, being themselves engravings. The gratings vary from 40 to 400 lines to the inch, mechanically ruled on plate glass, then filled in with black. For the coarse newsprint, screens are 60 line, for regular magazine black-and-white, 120 to 150, for color work, 150 to 200. A newspaper portrait, photographed through a 60 screen on a metal plate, will be made up of 3600 dots to the square inch, varying in size and shape, standing out because the etching acid has lowered the metal between dots. The picture, as reproduced, is really an optical illusion, being a jumble of dots rather than a continuous image. Inasmuch as no screen appears in our magnified views of either dollar bill or postage stamp, it is clear that neither has been reproduced by the halftone process. To see the difference, examine various reproductions of photographs in newspapers and magazines with a hand lens.

The earliest banknotes were printed by hand, with the amounts written in. Somewhat later came the printing of notes for one and two pounds in England, by the late 1700s, and with them came the counterfeiters! Ever since there has been waged a bitter and relentless game between them and the engravers, with first one side then the other effecting a gain. What one man can make another can imitate, and the task of governments soon settled down into one of making the copying more and more difficult, discouraging all but the most skillful and determined of forgers.

Since 1885 red and blue silk fibers have been incorporated in United States currency paper, and the manufacture of this sort of paper for other purposes is prohibited by law. Hence a counterfeiter must either own a paper mill, in which case he is too wealthy to engage in this hazardous business, or he must steal U. S. paper, which is about as easy as breaking into the mint, or he must use colored inks. Obviously, the third recourse is the only one open to the professional crook. The proper paper has a characteristic feel, crispness and a crackle when snapped or handled. These are difficult to imitate. All features of this paper are, of course, closely guarded official secrets.

In 1925, a survey showed the average life of a dollar bill to be only eight months, the chief damage coming from folding. In our illustrations, note the damage done to the fibers of the paper at one side of Washington's eye through creasing. A new size of bill was introduced in 1927, about one-third smaller, and with the paper improved, seasoned, and surface-treated. But money will wear out, in spite of all that can be done, and millions in bills find their way back, via the banks, in a steady flow, to be destroyed at the Bureau of Engraving and Printing, where they were made just a short time before.

Keep that dollar bill you have been inspecting until next month, if you can. We will be back with further details of the methods by which the fine work on this steel engraving is made and reproduced, and how Jim, the Penman, is foiled. And remember always the clarion words of Dick Tracy, "Crime never pays!"

Herbert R. Spencer

THE MICROSCOPE MAKERS

VIII. Herbert R. Spencer and Successors

THE third member of the illustrious trio whose labors and talents led to the establishment of the Spencer Lens Company was Herbert R. Spencer, son of the founder. Starting in 1838, Charles A Spencer (Aug-Sept., 1949, issue) had amazed the scientific world by turning out superlative objectives from his shop at Canastota, described then as in the "wilds of western New York." The father's microscopes, incorporating fluorite ele-

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ments and stressing high 'aperture for greater resolution, were the first made in America and came to be considered by critics of that period as the world's finest.

Then arrived the unschooled genius, Robert B. Tolles (Dec., 1949, issue), first as Spencer's apprentice, later his chief craftsman, and, still later, an independent manufacturer, the maker of unsurpassed objectives with even greater aperture and correction. With his father and Tolles as teachers and companions, Herbert's training was easily the finest the world afforded.

Herbert R. Spencer was born at Canastota in 1849, one of six children. As a lad he divided his time between the outdoors and the shop, taking a keen interest in both. We have no information about his education, which would seem to present nothing out of the ordinary, but we do read that he was fond of hunting, and that his training afield sharpened his eye for observation of detail, a training that was furthered and centered when he made his own lathe and proceeded to turn out his own objectives.

In 1880, one year before the death of his father, Herbert went into business for himself, under his own name, in Geneva, New York, manufacturing microscopes, telescopes, and objectives. From all accounts it appears that the son inherited the father's genius and that the productions of Herbert carried on the family name and reputation, adding new luster. His objectives and instruments of the '80s and '90s seemed to have been as perfect, and as much sought after as those of his father and of Tolles of the '50s to '70s. As far as the scientific world was concerned there was no break in the continuity and quality of Spencer products, no matter the changes in organization and location.

In 1889, Herbert moved the business to Cleveland, Ohio, where he established the H. R. Spencer Optical Company. Two years later he moved again, this time for keeps, to Buffalo, New York, forming a partnership with Fred L. Smith, the firm name becoming the Spencer and Smith Optical Company. In 1893 this Company was reorganized and incorporated, with a capital stock of $30,000, with Roswell Park, M.D., as president, Joseph Kittinger vice-president, Harlow H. Boyce secretary and treasurer, Herbert R. Spencer superintendent, and Fred L. Smith assistant superintendent. The address was 367 to 373 Seventh St., Buffalo. Their letterhead stated they were "Manufacturers of Microscopes, Telescopes and Accessories. Lenses of every description."

However, there was still insufficient operating capital and, two years later, in 1895, another reorganization brought in William H. Glenny as vice-president, with additional financial assistance. Now, for the first time, the name became Spencer Lens Company. Dr. Park remained as president, and B. L. Jones became secretary and treasurer. The names of Kittinger, Boyce, and Smith no longer appear on the 1898 letterhead.

These changes relieved Spencer of responsibilities for the business end and permitted his concentration on manufacturing. He sought continual improvement of established items and the development of new ones. Placing all of his formulas at the disposal of the Company, he taught a staff of assistants the art of building fine objectives. Like his two illustrious predecessors, Herbert Spencer was never satisfied with his achievements, but sought always to improve all his past productions.

Business success had now arrived, but the surviving Spencer was to see only its beginning. After a few months illness, he died in 1900, having expressed his satisfaction that the work of his father and himself would be carried on. One of their biographers, Dr. William C. Krauss, calls attention to many remarkable similarities in the characters of the trio, Charles Spencer, Tolles, and Herbert Spencer. Each of these men had an innate confidence in his ability, an acute comprehension of the laws of optics, outstanding skill and ability, constant striving for a better product, a retiring, unassuming disposition, shyness, dislike of notoriety, and inability to make money. Their lives, labors, and accomplishments have been commemorated by the American Microscopical Society with the establishment, in 1884, of the Spencer-Tolles Fund. In 1902, Herbert Spencer's name was officially included, with those of his father and Tolles. More than forty grants-in-aid for research have been made from this Fund.

In 1903, Harvey M. Ott joined the company and became an important factor in its further success. Most microscopists of the present time remember him as president of the firm. By 1926 Spencer Lens had outgrown its quarters, and moved to 19 Doat St., where they remained until 1938, then moving into their new and modern industrial plant on the outskirts of Buffalo, known locally as the S.I.D. Plant, abbreviated from Scientific Instrument Division. For, in 1935, the Spencer Lens Company as such ceased to exist, being purchased by the American Optical Company, of Southbridge, Mass., Spencer hence becoming a Division of the parent firm.

The present title and mail address of the business instituted by the Spencers is the American Optical Co., Scientific Instrument Division, Box A, Buffalo 15, N. Y. There is currently no connection by blood or marriage of any stockholder with any member of the Spencer family. B. Glenny, nephew of the former vice-president of 1895, is general manager; J. G. Williams, personnel director; W. F. Peck, plant manager; H. D. Rhynedance, sales manager; A. H. Bennett, research director; M. G. Brown, manager of development; and J. V. Cockin, manager of product sales. Much of our own correspondence has been with Dr. Oscar W. Richards, research biologist. The Division employs approximately 1300 individuals, and manufactures a wide variety of optical instruments — microscopes of many types, their accessories, microtomes, spectrographic equipment, projection apparatus, ophthalmic and other instruments. The American Optical Company was founded in 1833 and, in addition to the Southbridge and Buffalo plants, has manufacturing divisions at Brattleboro, Vt., Putnam, Conn., Nicollet, Que., and Belleville, Ont. There are branch offices in 281 cities, and more than 12,000 men and women on the payroll.

"And another thing, Miss Hastings. In the future, when you make out your laboratory reports, will you please use the phrase 'ultramicroscopic' in preference to 'itty-bitty'?"

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Two-Way Tube

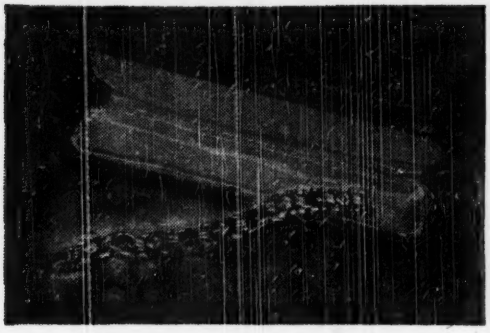
By CHARLES EDGAR GILLIAM

A microscope creates
Gigantic miracles
Of wide-eyed mites,
That peering up may see,
Haloed in lights
Against the wall,
Man as he is —
Small!

What other Christmas present can you name that...

. . . you wouldn't want to exchange

. . . comes in so handy on rainy days



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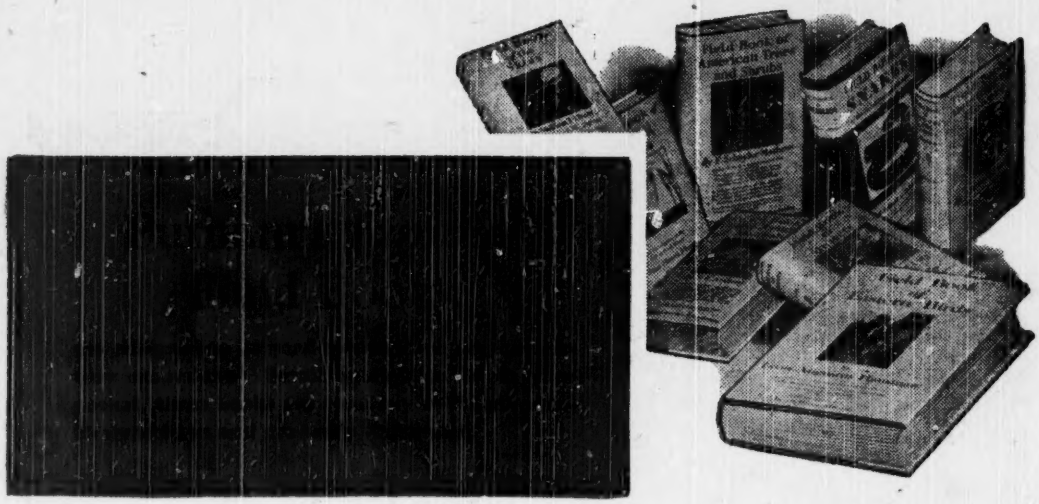

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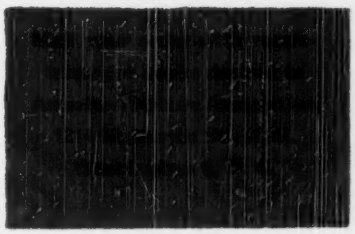
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